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Higher Transmission Voltages

THEME OF THE POWER CONVENTION AT TORQUAY

THROUGHOUT the world a question of to-day is how rapidly growing demands for electricity can best be met from generating resources which tend to become less conveniently situated for economic exploitation. Generally this entails the transmission of greater amounts of power for longer distances. Consequently system stability, which is inversely related to reactive voltage drop and is thus a function of kVA-miles, threatens in many cases to reach the maximum limit to which electric power can be sent at existing voltages.

Various means have been devised for extending the stability limit, but they appear to be palliatives for existing shortcomings rather than complete answers to the question. Probably the only ultimately satisfactory way is to raise the voltage to considerably higher values. Since there is immediate need to deal with the technical problems thus introduced and also to test under long-time service conditions the economy and reliability of the solutions reached, a more apt theme than the various aspects of working at 200 kV and over could hardly have been chosen for the first British Electrical Power Convention.

Transferring Large Blocks of Power

In this country the 132 kV grid, originally intended mainly for the interconnection of power stations to permit the pooling of spare plant and the preferential loading of the more efficient generating units in almost self-contained areas, has proved more than adequate for its original purpose. Since the grid was first laid out, however, consumption has increased five times and there has been some shifting of area demands, with the result that the additional duty has been imposed on the system of transmitting large blocks of power from one part of the country to another. The effect of this considerable departure from the initial conception of the functions of the grid will undoubtedly become more important in the future, when new power stations have to be built on sites more remote from load centres.

Improved Flexibility

Connection between wider areas for heavier current transfers rather than between power stations should now be the criterion, and Mr. T. G. N. Haldane seems to us to have established a broad case for a 300 kV "national bus-bar." His expectation that its capital cost would probably be defrayed by monetary savings seems reasonable, bearing in mind that the 132 kV grid more than paid for itself in that way. Even more to the point perhaps is the improvement in flexibility which it would introduce into day-by-day working, which if available to-day would, no doubt, have mitigated some of the effects of plant shortage.

That his view is in no way Utopian is evident from the support given to it in the Convention papers on transmission lines and cables, transformers and switchgear, which present factual justification for the confidence felt by British

electrical manufacturers in their ability to cope with 300 kV—a result of their habit of looking well ahead of contemporary practice.

Fourteen countries were listed in which voltages in excess of 132 kV are either in use or are projected, ranging from 150 to 380 kV. There also looms ahead the possibility of linking up with Continental systems to secure mutual advantages from diversity (which would be worth many megawatts of plant capacity) with regard to generating resources (e.g., thermal and hydro), weather, seasons and times of use of power. Not the least important aspect of high-voltage development is the opportunity it would give British manufacturers for obtaining field experience here at the highest a.c. and d.c. voltages, thus enabling them to continue to pioneer electrical advances anywhere in the world.

NEXT YEAR'S CONVENTION

IF the late Incorporated Municipal Electrical Association had not bequeathed its annual convention to the electrical industry it would have been necessary to institute one. An industry whose sections are so closely associated as ours must have a means of getting together as a whole at least once a year. The continuance of the British Electrical Power Convention was, therefore, in little doubt. In Sir Vincent de Ferranti, the new President, the Convention has a leader from the manufacturing side with all the necessary qualifications for a task that is by no means a simple one. Although Sir Vincent stressed the difficulty of taking over from such a personality as Lord Citrine, we feel sure that the second Convention will be as successful as the first. As regards the meeting place, rumour seems to favour the north of England.

RULES AND REGISTRATION

MR. F. W. PURSE, opening the discussion at Torquay on Mr. P. G. Wallis's paper (reported in this issue), said that the author had trailed his coat pretty widely. He had: and everybody expected Mr. Purse to tread on the tail of that coat, for Mr. Wallis had raised the question of compulsory registration and rules. Mr. Purse was, of course, in favour of voluntary registration of contractors, the advocates of which, he said, were now in a stronger position than ever before. He also contended that the supply authorities already possessed the power to enforce rules by refusing to connect installations which were inadequate and unsafe. Mr. Wallis's rejoinder was that, while the authorities might have had the power, most of them had never exercised it.

MERCURY POWER

WHAT appears to be the first post-war mercury power plant is now operating in the South Meadow station of the Hartford (Conn.) Electric Co., U.S.A., replacing a somewhat smaller set that has been in service there for twenty years. Both are examples of "topping" installations, the mercury plant being superimposed on existing steam plant to extend the working range of temperature. The new plant has a boiler in which liquid mercury is vaporized at the low gauge pressure of 113 lb/sq in and the relatively high temperature of 945 deg F for driving a mercury turbo-generator of 15,000 kW at 720 r.p.m. A condenser associated with a second boiler enables the heat given up by the condensing mercury to be employed for converting water into steam at the rate of 200,000 lb/h at 400 lb/sq in and 700 deg F for driving existing turbo-generators. The binary system, which combines the mercury and steam cycles, is claimed by the American General Electric Co. to be more economical thermally than either alone.

GRADUATES' SALARIES

THE common complaint that salaries offered to engineering graduates in this country are too low lends interest to a note in the American *Electronics*. It gives the results of a survey conducted by New York University among its recent engineering graduates. It was found that in 1947 the "electricals" headed the list with an average commencing salary of $238 per month, followed by civil, chemical, mechanical and aeronautical graduates, in that order. In 1948, however, the "electricals" fell to fourth place, being preceded by the chemical, mechanical and civil engineers. The average starting salary went up by 5.5 per cent to $250.

Stand-by Generating Plant

Automatic Cartridge Starting at an Aerodrome

By I. F. HAY, Associate I.E.E.

THE installation of engine-driven generators to safeguard essential electricity supplies during load shedding or mains failure has entailed a considerable problem in the provision of operating staff, particularly with shift working over the twenty-four hours. The cost of skilled labour and waste of man-hours will usually warrant an investigation into the possibilities of conversion to fully automatic operation. Under present conditions more or less standard-production apparatus that can be fitted and serviced without specialist staff is required. A recent experimental conversion of an existing plant on an airfield in this country suggests possibilities of far wider application.

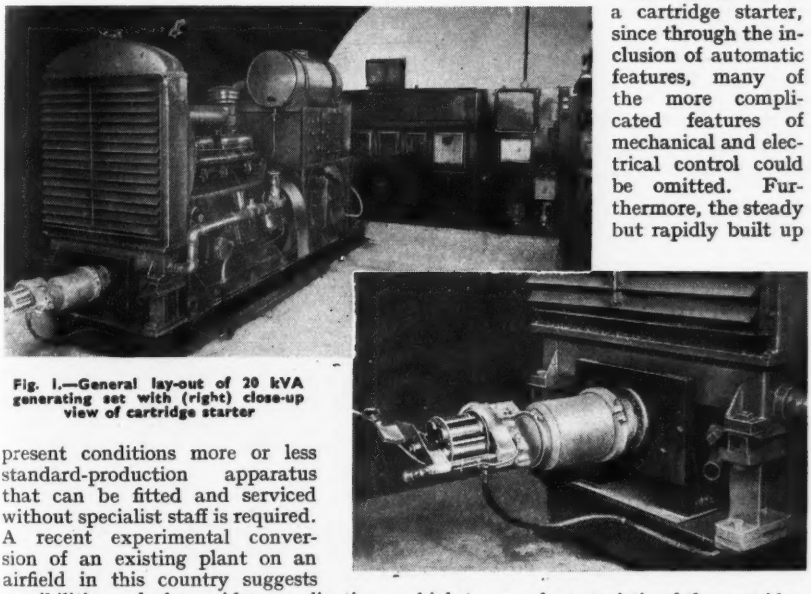

Fig. 1.—General lay-out of 20 kVA generating set with (right) close-up view of cartridge starter

The electrical installation comprised a 3,300/400-230 V isolated substation feeding runway lighting, instrument landing and other radio aids to aircraft navigation, and a local standby generating plant was deemed essential. The most suitable plant available was a four-cylinder 1,000 r.p.m., 38 h.p. diesel engine direct-coupled to a 20 kVA three-phase alternator with built-in exciter and separate carbon-pile voltage regulator. The engine was originally hand-started, and it was necessary to operate decompression knobs together with extra compression valves during starting and fuel-pump control for stopping; a very considerable effort by two men was required for starting in cold weather.

Various methods of automatic starting were considered, the most promising of which was the use of a cartridge starter, since through the inclusion of automatic features, many of the more complicated features of mechanical and electrical control could be omitted. Furthermore, the steady but rapidly built up high-torque characteristic of the cartridge starter would ensure even starting under varied weather conditions.

The starter has been mounted in place of the original hand-starting bracket, and is arranged to engage a standard aircraft-type twelve-point dog fitted directly on to the engine crankshaft. It has proved capable of accelerating the engine to 300 r.p.m. against full compression,

dispensing with the decompressors and the extra compression valves, a compromise compression ratio of 17 to 1 being employed. To obtain electrical operation the starter has been fitted with a 24 V d.c.-operated breech mechanism, originally developed for aircraft-engine starting, and a magazine capable of giving five starts without reloading. (Method of fixing starter shown in Fig. 1.)

The fuel pump on the engine has been fitted with a spring-loaded linkage, normally holding the pump in the stopping position, and a solenoid wound for 24 V d.c. to lift the linkage on starting. Automatic-control apparatus has been developed from a change-over contactor fitted with mechanical and electrical interlocks to prevent paralleling the alternative supplies. Protection against phase failure or low voltage on the normal outside supply has been effected by a sensitive d.c. relay fitted with mercury-tube switches. Input to the relay is from a small metal rectifier, which in turn is fed through resistances from each phase. The balance is so adjusted that the relay will trip on a reduction of more than 17 per cent in voltage on any or all phases and automatically reset on a return to within 6

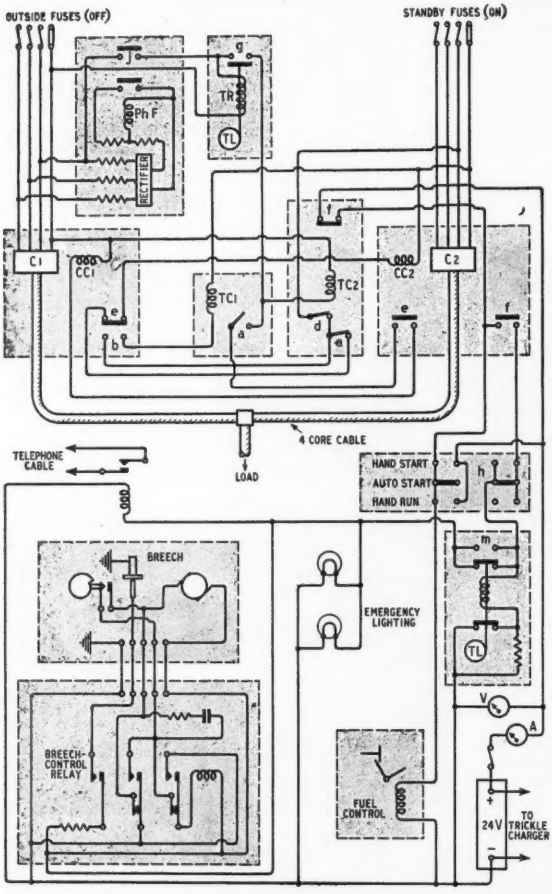

Fig. 2.—Circuit diagram of automatic change-over and starting sequence

per cent. This relay has proved effective in dealing with the lighting, heating and instrument load. The resetting of the phase-failure relay will not effect a change over immediately to outside supply, as this operation has been deliberately retarded for 30 sec by a time-delay relay as a safeguard against a purely momentary restoration of supply. All auxiliary operations are carried out at 24 V d.c., making it possible to employ several standard aircraft accessories. The maximum current in the d.c. circuit amounts to 6 A during starting and 1½ A, covered by the output of the battery charger, during running so that a very small capacity battery only is required.

As shown in Figs. 2 and 3, the trip coil TC2 is constantly energized from the mains supply, but contacts *f* on TC2 are normally separated. Failure of

mains supply or reduction in voltage of 17 per cent on the phase-failure relay, PhF will cause these contacts to close and complete the cartridge firing circuit through contacts *f* on the standby contactor C2, the repeat relay contacts m, the hand control switch *h*, breech control relay and breech motor switch. At the same time the fuel control solenoid releases the fuel pump into the running position. When the set starts and contactor C2 closes the contacts *f* on C2 clear the firing circuit. In the event of a failure to start, the repeat relay will momentarily break the firing circuit after 15 sec, thereby resetting the breech control relay and firing a second cartridge. The four-core cable with tee-off to a multi-pole load (Fig. 2) is diagrammatic; actually the contactors C1 and C2 feed on to busbars and thence to a number of switch-fuse points for outgoing feeders. The layout of the experimental control panel is illustrated in Fig. 4.

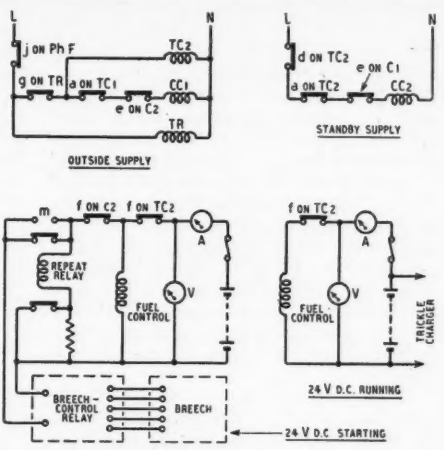

Fig. 3.—Circuit interlocking details

Simple back indication to a central control point has been arranged over telephone cables and if necessary this refinement can be extended to suit local circumstances. An hour meter records the actual hours run, routine maintenance being based on these figures and the number of starts effected.

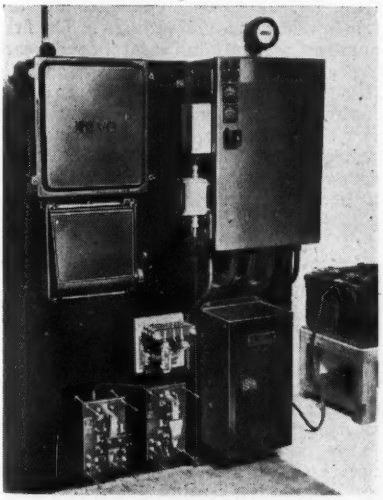

Fig. 4.—Experimental control panel showing relays with covers removed

For the tests two types of cartridge were used, the No. 7 Mark 1 developing a maximum torque of 1,760 lb-ft and No. 7 Mark 3 developing 1,280 lb-ft. The latter gave ample power under all normal weather conditions. A graded safety disc safeguards the apparatus against excessive pressures.

In practice, results have exceeded expectations in that the cartridge starter has been used over fifty times under working conditions without recourse to the repeat relay. The engine attains 1,000 r.p.m. and the set maintains steady voltage on the required load of 7 kW in under 10 sec. The lubricating oil temperature should be maintained at not less than 50 deg F and experiments are at present being carried out with immersion heaters.

Conversion of diesel engines of up to 200 h.p. where the crankshaft and general engine design permits, are under consideration.

I should like to acknowledge the assistance given by the Plessey Co., Ltd., and the Watford Electric and Manufacturing Co., Ltd., whereby these initial experiments were brought to a successful conclusion.

Views on the News

By REFLECTOR

IF the first British Electrical Power Convention was successful (and nobody who was there can deny that success was achieved), something more than the lion's share of the credit must go to Lord Citrine, the President. His good humour and courtesy made everyone feel that he was a personal friend, and this feeling was intensified by his amazing memory for names and past meetings. As he so touchingly acknowledged at the general meeting, he was wonderfully supported during an arduous but happy week by Lady Citrine, whose natural charm endeared her to all the delegates.

★ ★ ★

Those present at the presentation of Mr. P. G. Wallis's paper on the electrical contractors' place in the industry were immensely amused when, just, as Mr. R. A. S. Thwaites was concluding his contribution to the discussion, there was a loud explosion of a photographer's flash-bulb. The incident was turned to good account by the President, who suggested that it was either the fusing of an electric wire or an indication to Mr. Thwaites that he was out of order. He was, indeed, for, although his tribute to Oliver Heaviside was endorsed by the audience, it was hardly germane to the subject of the paper. It would have been difficult, however, for the speaker to find an appropriate opportunity for this well-merited encomium.

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An engineer in one of the B.E.A. Divisions told me at Torquay that he felt himself to be merely part of a machine, and he complained of administrative delays in the provision of new generating plant. On the other hand, a man on the administrative side of another Division said that his people were given a relatively free hand in the making of decisions. There seems to be a feeling that too many people have to approve too many developments (not all of them major ones), a malady which all large organizations are liable to contract. The remedy is decentralization and the conferring of greater responsibility and freedom of action upon the men who are actually in charge of particular jobs.

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When I learnt that the Customs and Excise authorities had decided that immersion heaters designed for industrial use with elements encased in steel, lead or lead coated sheaths would not be subject to purchase tax irrespective of their loading, I thought I detected another opportunity for tax evasion. Much as I disapprove of this tax I am somewhat relieved to find that is unlikely. Apart from the fact that tax would most certainly be reimposed if it were found that such apparatus was being sold for domestic purposes, the higher cost of producing this type of apparatus would counterbalance any savings in purchase tax. Furthermore, steel sheaths rust very quickly in water, while with the use of lead the risk of poisoning cannot be overlooked.

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The latest addition to the host of Electricity Board and Division magazines is *London Generation*, produced by the London Division of the B.E.A. The first number has a neat and modest cover bearing an excellent picture of Lambeth Palace. As befits a Divisional journal, the contents are largely of a technical character; the articles are informative and well written. The social and personal side is not neglected, however, and altogether the Editor (a great friend of mine) has done a good job.

★ ★ ★

I see that television receivers incorporating 2½in tubes and projection systems giving a picture 16in by 14in are now making their appearance on the American market. Although no British made projection sets have yet been brought out, this does not mean that we are in any way backward in technique. Most if not all the principal manufacturers have projection sets "up their sleeves" and I rather gather that it is economic rather than technical considerations that are causing them to stay their hands.

Grain Drying

Results from 1948 Harvest

By
E. C. CLAYDON*

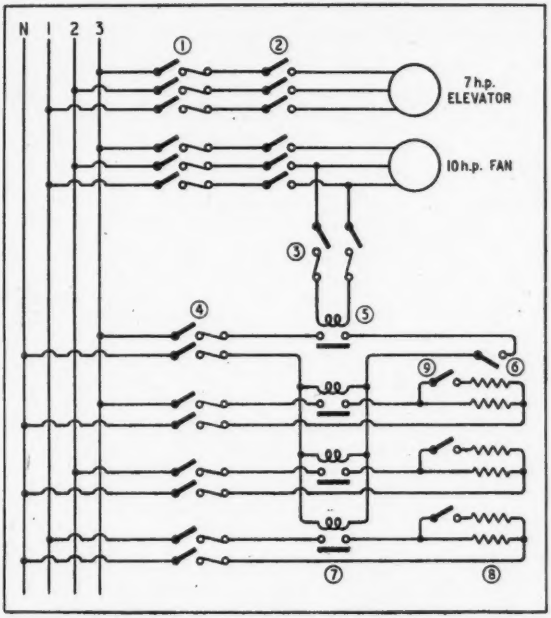
A DESCRIPTION of the first ventilated bin grain dryer built on a farm (at Leighton Buzzard) was given in the *Electrical Review* of 10th September, 1948. In view of the number of similar installations being built or contemplated during this season some further details of the performance of the dryer may be helpful.

The principle is that of drying grain in storage bins by continuous forced ventilation with air at about 10 deg F above atmospheric temperature. This air temperature is so low that there is no risk of damage to the grain by overheating or overdrying and, therefore, no need for continuous supervision. Complicated control gear and equipment is avoided.

Results of the 1948 harvest confirmed past experience regarding the efficiency of this method. Grain was brought from the combine and emptied into a hopper, whence it was conveyed pneumatically to the bins. Ventilation was commenced when the height of grain in the bins reached 3ft and continued during and after the filling of the bins until the grain was dry enough for storage. When the grain was coming in damp, the bins were only half filled and when dry the contents of two bins were stored together in a single bin.

The aim throughout the drying period was to use air at 60 per cent relative humidity. In practice, the heat was switched on at night and off during the day when the r.h. value had fallen to about 75 per cent. This saved electricity by making use of the natural heat of the air and resulted, as will be seen later, in somewhat remarkable efficiency figures.

Records taken over the drying period showed that the r.h. value during the last two weeks of August averaged 84 per cent, and during the first three weeks of September 85 per cent. Since these figures correspond to a grain moisture content of about 19 per cent, it is apparent that drying without heat is impracticable in a normal season such as was experienced in 1948.



Wiring diagram of ventilated bin grain dryer

(1) Motor isolator. (2) Motor starter. (3) & (4) D.p. switch-fuses. (5) 415 V s.p. contactor. (6) Heater safety cut-out. (7) 230 V t.p. contactor. (8) 14 kW heater (6 elements). (9) 15A q.m.b. switch

* Agricultural Engineer, East Sussex and S.W. Kent Sub-Area, South-Eastern Electricity Board.

The moisture content of the grain before drying averaged 19.2 per cent and after drying 16.25 per cent. The total quantity dried was 166 tons and almost 6 tons of water was removed. The quantity of heat used for drying was equal to 717 B.Th.U. per lb of water evaporated, which corresponds to an efficiency of 140 per cent so far as the heating is concerned. Taking heating and power units used into consideration, the overall working efficiency of the plant was found to be 60 per cent.

The costs of this system were found to compare very favourably with other methods. The local tariff was 1.7d per kWh for power and 1.1d for heat, which gave a total cost of £40 for drying over 160 tons of grain, or something under 5s per ton. This amounted to 1s 8d per ton per 1 per cent moisture extraction.

Experience with the dryer has indicated that the original loading of 21 kW for the heater battery was generous and that the three-heat control provided was not flexible enough for varying conditions of drying. It has, therefore, been decided to reduce the total loading and increase the number of stages of heat control. In the case of the Pitstone dryer there will be nine stages of control, but for a standard arrangement it would seem that six stages would meet requirements, with a total loading sufficient to give a 10 deg F air temperature rise in the duct under the most onerous conditions of use. The accompanying diagram shows the amended arrangement.

The simplicity and low cost of this method of drying grain commend it to the small farmer, whilst the low electrical loading and excellent load factor make it of special interest to electricity supply authorities.

Conditions in Peru

HYDRO-ELECTRIC DEVELOPMENT PLANS

IN his report on economic and commercial conditions in Peru, published for the Commercial Relations and Exports Department of the Board of Trade by H.M. Stationery Office at 1s 6d net, Mr. W. G. Bruzaud (First Secretary (Commercial), H.M. Embassy, Lima), says that the necessity for increasing the supply of electric light and power for Lima and suburbs resulted in plans being drawn up in 1946 for the construction of a hydro-electric power station of 63,000 kW at Chosica. Work on this project was started in January, 1947, and, according to present calculations, should be completed in 1951.

The use of electricity in Peru has developed so considerably that existing power plants have become quite inadequate to supply the demand. New hydro-electric installations are, however, in course of construction and others are being planned. Imports of electrical supplies and equipment in 1939 had a value of soles 9,789,000, against soles 33,510,000 in 1946. In the former year the principal sources of origin were the United States and Germany. In the latter year, the United States, United Kingdom, Sweden, Switzerland and Canada supplied material to the vale of soles 21.2 million, 3.4 million, 2.6 million, 2.1 million and 1.6 million, respectively. This included dynamos and motors, transformers, accumulators, incandescent lamps, stoves, refrigerators, lighting and heating apparatus, telephone equipment, cables, wiring and electrical accessories of all kinds. There is a general scarcity of most of these articles owing to import restrictions.

Lighting in Workshops

THE fact that good general working conditions, as well as efficient machinery, are important in modern industrial practice is given due emphasis at Lever Bros. (Port Sunlight), Ltd., where a B.T.H. fluorescent lighting system has been incorporated in an overall redecoration scheme in the engineering workshops. The new lighting scheme consists of 114 "Mazda" trough reflector fittings, housing 80 W 5ft fluorescent lamps, mounted in parallel rows running the length of the workshops at a height of 19ft above floor level. Spaced at intervals of 18ft, these fittings provide an excellent level of overall illumination. The reflectors used have upward light slots permitting some illumination to be dispersed upwards, thus avoiding too great a contrast between fittings and ceiling. This also makes the most of the bright colours of walls and ceiling following redecoration of the premises, the lathes, drilling machines, planes, etc., being all coloured to match. The lighting installation was planned by lighting engineers of the B.T.H. Co., who also supplied the equipment, and the electrical installation work was carried out by Lever Bros.' own staff.

Ammeter Shunts

Series and Parallel Arrangements

By G. W. STUBBINGS, B.Sc., A.M.I.E.E.

A MOVING-COIL switchboard ammeter is normally employed with a single shunt, but in some circumstances it may be used with two shunts connected either in series or in parallel. The series connection provides two ranges for the instrument, either of which may be selected at will; the parallel connection is used to increase the range of the instrument beyond that corresponding to the rating of the larger shunt.

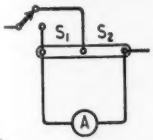


Fig. 1—Simple series arrangement of shunts

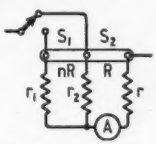


Fig. 2—Method of avoiding the use of a non-standard shunt

With the simplest series arrangement of two shunts (Fig. 1) by means of a selector switch, the current to be measured can be passed either through the shunt S_2 of the higher rating or through the two shunts S_1 and S_2 in series. In the latter case the ammeter is responsive to the sum of the voltage drops in the two shunts. When the high range shunt is in use, the low range shunt is in series with the instrument, and unless its rating is very small it will have a negligible effect on the instrument reading. If the lower range of the instrument is to be a fraction $\frac{1}{n}$ of the high range, then the series resistance of the two shunts must be n times that of the high range shunt. The resistance of S_1 must therefore be $(n - 1)$ times that of S_2 and S_1 must be a non-standard shunt.

The necessity for a non-standard shunt can be avoided by connecting the instrument as shown in Fig. 2. If r is the resistance of the normal lead connecting the instrument to the end of the high range shunt, the instrument connections are made to the end of the low range shunt and to the common connection by resistances having the values r_1 and r_2 respectively. If r_1 and r_2 are adjusted to be in correct proportion to r, then the range of the instrument, when connected to the two shunts in series, will correspond to the rating of the low range shunt, provided, of course, that the full-load millivolt drops of the two shunts are equal.

If the instrument is removed from the network the potential difference between the open points of the network, per ampere of current passing through the two shunts in series, will be $R\left(1 + \frac{nr_2}{r_1 + r_2}\right)$ where R and nR are the voltage drops per ampere in the shunts. It is easy to see that if $\frac{r_2}{r_1 + r_2} = \frac{n - 1}{n}$ the potential difference will be equal to $R(1 + n - 1) = nR$, the voltage drop in the low range shunt. According to Thevenin's theorem, the instrument current, when reconnected in the network, will have its correct value corresponding to a voltage drop of nR per ampere, if the parallel resistance of the two connections to the low range shunt is equal to r the resistance of an ordinary connecting lead. Otherwise $\frac{r_1 r_2}{r_1 + r_2} = \frac{r_1(n - 1)}{n}$ and must be equal to r. Thus $r_1 = r \times \frac{n}{n - 1}$, whence r_2 will be found to equal nr. Thus, if the rating of the low

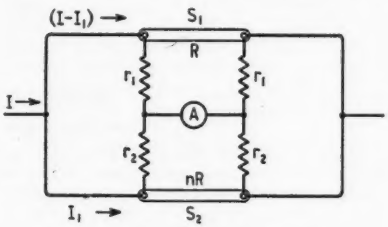


Fig. 3.—Parallel connection of two shunts

range shunt is $\frac{1}{10}$ that of the high range shunt, the connecting lead r_1 must have a resistance, or be of a length $\frac{10}{9}$ that of the ead r. The connection of the instrument to the mid-point of the junction of the two shunts must have a resistance equal to 10r.

Fig. 3 shows the parallel connection of two shunts the resistances of which are R and nR. The instrument is connected to the shunt of resistance R by two leads each of resistance r_1, the connection to the other shunt being made by leads each of resistance r_2. The main current I passes through the shunts in two fractions, $I-I_1$ and I_1. If the instrument is removed from the network, the potential difference between the open points for any division of the main current is determined by the graphical construction (Fig. 4) where ABCD is a trapezium the parallel sides of which represent to scale the voltage drops in the two shunts. The potential difference between the open points is given by the line EF parallel to AB, where $\frac{ED}{DA} = \frac{CF}{CB} = \frac{r_2}{r_1 + r_2}$. It can be seen that this is the smaller drop plus a fraction $\frac{ED}{DA}$ of the difference of the drops, or $R\left[nI_1 + \frac{r_2}{r_1 + r_2}(I - I_1 - nI_1)\right]$, so that if $\frac{r_2}{r_1 + r_2} = \frac{n}{n + 1}$, it will be $RI \times \frac{n}{n + 1}$, the drop due to a current I in a shunt of resistance $\frac{nR}{n + 1}$, the rating of which is the sum of the ratings of the two shunts forming the parallel arrangement.

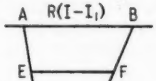


Fig. 4—Construction for determining the potential difference across the instrument in Fig. 3

When the instrument is reconnected, the current flowing through it will be proportional to this voltage drop if the parallel resistance of the connections r_1 and r_2 is equal to that r of a lead used for the normal connection to a single shunt. Combining the two conditions, $\frac{r_1 r_2}{r_1 + r_2} = \frac{r_1 n}{n + 1} = r$, $r_1 = r \times \frac{n + 1}{n}$ and $r_2 = r = (n + 1)$. If these conditions are satisfied, the instrument will indicate correctly with a range corresponding to the sum of the ratings of the two shunts, irrespective of the division of the main current between them. Thus, if the shunt ratings are 500 A and 250 A, $n = 2$ and the instrument must be connected to the 250 A shunt by leads each of which has a length $n + 1 = 3$ times that of a normal lead, while the connection to the 500-A shunt must be made by a lead $\frac{n + 1}{n} = \frac{3}{2}$ times that of normal length.

South African News

From Our Cape Town Correspondent

ONE purpose of the Electricity Amendment Bill now before the House of Assembly, according to an explanatory memorandum tabled by the Minister of Economic Affairs, is to repeal a provision in the original Act which makes it illegal for any employee of the Electricity Supply Commission to become a member of the Commission. The present Bill lays down that any employee who is appointed a full-time member of Escom shall retain his ordinary remuneration in addition to that as a member of the Commission.

Mr. S. Fitzpatrick, of Port Elizabeth, invented his "repulsometer" at the request of the warden of the Addo Game Reserve, for the control of elephants. It has been adjusted for the use of stock control and was exhibited recently at Port Elizabeth. The inventor says that farmers will be able to control the movement of their stock with apparatus that will electrify a 22-mile single wire fence, using a 6 V car battery.

Johannesburg Electricity Department showed a net surplus of £236,108 for the financial year ended 30th June, 1948, according to the annual report of the general manager. The number of kWh sold during the year increased by a further 11.2 per cent, due largely to an increase in consumption by private consumers. A total of 571 million kWh was generated (346 million at Orlando), generation costs falling from 0.174d to 0.1723d per kWh sent out, although coal costs increased from 10s 4d to 10s 7d per ton.

Correspondence

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents

Trade] with Canada

I RECENTLY drew attention, in an article under this heading in your issue dated 10th June last, to the difficulties encountered by British manufacturers in attempting to enter the Canadian market. Since this article was written the Canadian Government has announced that as from 1st July such articles as, *inter alia*, electric dry shaving machines, Christmas tree lighting sets, electric heating pads and blankets, hair waving and drying machines, electric fans, electric soldering irons and electric floor polishers will be removed from the prohibited list and permitted entry from the United Kingdom under Open General Licence.

No doubt electrical traders and manufacturers will welcome this announcement.

JOHN C. HANCOCK.

London, W.3.

Registration of Contractors

I NOTE that "Reflector" raises the old question of "cable festoons" and "link-ups," but am afraid those things will continue until something is done to stop them. This prompts me to comment on the paper at the British Electrical Power Convention by Mr. P. G. Wallis, for, although the paper contains sound reasoning, I am rather at a loss to understand two points.

First, Mr. Wallis states that the E.C.A. has come to the conclusion that elimination of shoddy work can be achieved only by compulsory registration of contractors and their operatives and the enforcement of regulations. It would be interesting to learn if the members of the Association would give this reform their backing and why the English E.C.A. withdrew its support from the National Register of Electrical Installation Contractors.

Secondly, Mr. Wallis states that the E.C.A. in itself is a voluntary register of experienced contractors, but, as expressed in Scotland, "I hae ma doots."

I have been an advocate of compulsory registration for very many years, but have come to the conclusion that the majority of those engaged in the installation industry have shown no enthusiasm for registration in any form. It has, unfortunately, to be admitted that in existing circumstances neither the E.C.A. nor the N.R.E.I.C. can guarantee high-class work, and, indeed, this has been amply proved by the Register's inspectors in their reports.

The N.R.E.I.C. has done its best under most difficult conditions, and could have been quite a powerful body if it had been properly supported by the "trade." The fact that out of thousands of people engaged on installation work, only a little over a thousand are enrolled in the Register is food for thought.

What will be the final outcome of negotiations no one can foresee, but it would appear that, even if we cannot obtain compulsory registration, it might, in the future, be to the detriment of contractors to remain outside the Register.

Glasgow. ALEX. MILNE.

Bathroom Installation

WE have recently installed an electric fire in a bathroom under the following conditions: mounted high out of reach; earthed via a three-core flex; connected via a three-plate ceiling rose; controlled by a pull switch, ceiling mounted; the fire so constructed that the only earthed portion is the parabolic reflector which is spaced away from the wall on moulded end plates, the tilting adjustment being via hanging non-conducting cords.

The Area Board has refused connection of this installation because of the absence of a uniform potential conductor.

I submit that under the above conditions the uniform potential conductor mentioned in I.E.E. Regulation 1002 is superfluous, and that its introduction could conceivably introduce a hazard not previously existing owing to the difficulty of obtaining (and maintaining throughout the future activities of plumbers, etc.) adequate bonding of all the metalwork concerned. The Regulation referred to specifically mentions socket-outlets, but makes no reference to physically isolated apparatus fixed out of reach, and I

suggest that a clear exemption from the necessity of installing a uniform potential conductor could be given to meet the circumstances outlined, this exemption to be on similar lines to that dealing with earthing in Regulation 1001.

It is of interest to note that two of the largest electrical suppliers in London cannot supply, and do not appear to have heard of, the tinned copper continuity strip required.

B. RAYNOR, *Director*,
JOHN TRAPP (ELECTRICAL), LTD.
London, N.8.

Beverley Minster Lighting

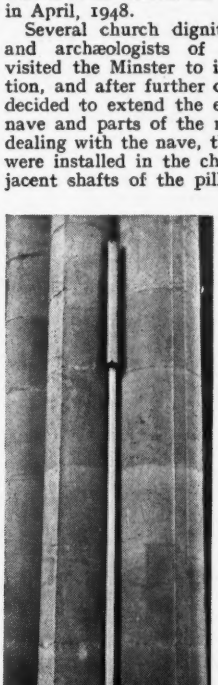
NEW FLUORESCENT INSTALLATION

A NEW lighting system has just been approved for installation in the Minster at Beverley, East Yorkshire, which is considered by many authorities to be the finest example of Gothic architecture in Europe. This proposal follows an experimental fluorescent lighting installation designed and carried out during 1948 by the staff of the Hull Sub-Area of the Yorkshire Electricity Board. Before the experimental installation was carried out, the use of more orthodox types of church fittings was considered, but none appeared to meet the particular architectural requirements of the building.

Fluorescent lighting in Beverley Minster

The east end of the Minster was selected for the first experiment, and fluorescent tubes were erected on the east side of the Purbeck marble pillars in the triforium so that the tubes were completely unobtrusive. Other tubes were fitted on appropriate pillars to provide adequate illumination on the rich tracery and sculptured details of the altar screen. The installation was first connected for an evening service in April, 1948.

Several church dignitaries, antiquarians and archæologists of note subsequently visited the Minster to inspect the installation, and after further consideration it was decided to extend the experiment into the nave and parts of the main transepts. In dealing with the nave, the fluorescent tubes were installed in the channels between adjacent shafts of the pillars just below the capitals, the base of the tubes being 14ft above floor level. Great care was taken in the installation so that no member of the congregation in the nave would see any part of the lighting source when facing east. This installation was completed during the autumn of 1948 and was in general use for the remainder of that winter.



Specially designed fitting incorporating control gear at end

The Minster authorities during this time visited other church buildings to help form an opinion on the relative merits of the experimental installation as compared with other types of lighting installed in other churches. It was finally decided, however, to proceed with the permanent installation of fluorescent lighting and it is hoped by the authorities that this will be completed before next autumn.

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

Dual Plug for Ring Main

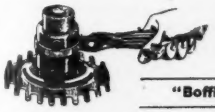
THE introduction by GEO. H. SCHOLES & CO., LTD., Wylex Works, Wythenshawe, Manchester, of a "Wylex" dual plug for ring main provides maximum convenience from socket outlets on ring main circuits without the use of adaptors. The "Wylex" ring main 3 kW

"Wylex" dual plug for ring main showing fuse replacement device

socket takes any of three plugs direct—3 kW, 5 A or 2 A. The 3 kW dual plug can be used simultaneously with a 5 A or 2 A plug, thus allowing the connection of two appliances. One socket can, therefore, give five alternative connections. All plugs are fused. An ingenious device for fuse replacement is incorporated in the new dual plug. The cartridge fuse in the base is held in position by a spring and sliding cover, the old fuse being removed and a new one inserted in 10 sec.

Hedge Trimmer

The "Boffin" electric hedge trimmer made by RAYLOR BROS., LTD., 81, Piccadilly, London, W.1, is available in three types—a household model



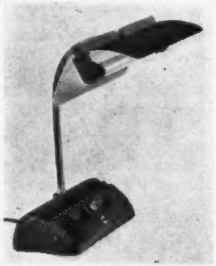
"Boffin" hedge trimmer

(£8 17s 6d, plus £1 2s 6d for an extension handle), a horticultural model (£10 10s, including extension handle and 50ft of three-core rubber-covered cable), and an agricultural model with an extra powerful motor (¼ h.p.) for trimming heavier growth, thorn hedges, etc. (£12 10s, including 3ft handle and cable). The apparatus operates in much the same way as an electric razor, a high-speed cutting blade shearing off the new growth and straggling ends as they are gathered in by the "teeth" on a safety feeder plate. A safety switch is fitted into each handgrip, the blade rotating only when the switch is pressed by the operator's thumb. No lubrication whatever is required.

For use where no mains supply is available, a 500 W self-contained petrol-driven d.c. generator unit is being marketed at £57 10s. Though intended primarily for driving two agricultural model hedge trimmers, it can also be used for operating electric tools and small domestic appliances.

Fluorescent Desk Lamp

The "Solite" fluorescent desk lamp made by "MOUNTSUN," LTD., West Mall Works, Rabbit Row, London, W.8, is of modern design and is available in black, burgundy, olive green or cream crackle finish with chromium supports. The 18 W 11in fluorescent tube is available in "daylight," "peach" or "warm white," and has a light output comparable with that of

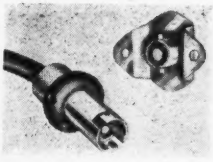


The "Mountsun" fluorescent desk lamp

a 60 W incandescent lamp, and has double the life. Complete with fluorescent tube the price is £5 12s, plus £1 7s purchase tax.

Co-axial Plug and Socket

A co-axial plug and socket made by AERIALITE, LTD., Castle Works, Stalybridge, is suitable for instrument connections, television aerial connections, amplifier sockets and, in fact, any point where a firm and easily removed junction is required. It has a spring-loaded plunger and bayonet fixing and will take a co-axial cable from ⅛in to ⅜in outside diameter. It is applicable to standard American and British car radio sets. The socket is fitted to the instrument or set and may be riveted thereto.



Aerialite co-axial plug and socket

All parts are of nickel-plated brass except the contacts, which are silver-plated. The socket cannot pull out, is easily fitted and removed, and has continuous contact pressure and locking. No soldering is re-

quired either for the plug or socket. The plugs cost 1s 9d each and the sockets 1s 6d.

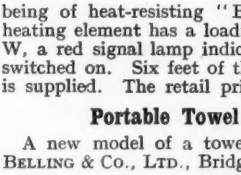
Waffle Maker

A waffle maker manufactured by S.L.R. ELECTRIC, LTD., 58-60, South Harrow Viaduct, South Harrow, has its lid fitted on a specially made hinge which allows it to rise during the cooking operation, thereby producing a waffle of even thickness. The apparatus is largely constructed of copper, chromium plated, the handles being of heat-resisting "Bakelite." The heating element has a loading of about 400 W, a red signal lamp indicating when it is switched on. Six feet of three-core flexible is supplied. The retail price is 75s.

S.L.R. waffle maker

Portable Towel Airer

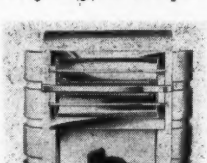
A new model of a towel airer made by BELLING & CO., LTD., Bridge Works, Southbury Road, Enfield, is arranged for pedestal instead of wall mounting. This overcomes objections to screwing the apparatus to the wall, perhaps through tiles, and also renders the unit portable if desired. Two sizes are available, one 14in wide and the other 23¼in wide, both being 24in high and 6in deep. The smaller model (104A) has a loading of 90 W and sells at £4 10s, plus £3 6s 2d purchase tax; the larger (105A), loaded at 150 W, is priced at £5 10s, plus £4 0s 11d purchase tax. The apparatus is finished in ivory stove enamel.



Belling portable towel airer

Log Fire

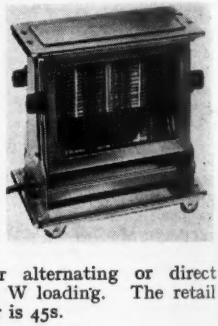
A realistic log effect is provided in the "Xcel" R.1018 fire manufactured by ELEXCEL, LTD., Victor Works, Broad Green, Liverpool, 14. The unit, which measures 25in square by 10in from front to back, is attractively finished in golden bronze. The two 1 kW elements fitted to the fire are housed in a single chromium-plated reflector and they are separately switched.



"Xcel" log fire

Glass-sided Toaster

The latest product of the HOTPOINT ELECTRIC APPLIANCE CO., LTD., Crown House, Aldwych, London, W.C.2, is a glass-sided toaster. It is sturdily constructed and has a high-grade aluminium alloy body and etched glass panelled doors. Special attention has been paid to raising the elements so that crumbs can be ejected from the toaster automatically. The toaster, which is suitable for either alternating or direct current, has a 600 W loading. The retail price of the toaster is 45s.



Hotpoint glass-sided toaster

Hair Dryer Attachment

A novel attachment which enables a vacuum cleaner to be used as a hair dryer has been brought out by RELIANCE DOMESTIC APPLIANCES, 152-4, Broadway, Bexleyheath. It can be fitted by its rubber connector to the hose end of any cleaner, cylindrical or bag type, arranged for blowing. A 240 W heating element controlled by a pear switch is incorporated and the flow of air can be regulated by a control knob at the side. Cream, green, blue and black finishes are available. The price of the attachment, including purchase tax, is 37s 6d.

Reliance "Vac" hair dryer

PERSONAL and SOCIAL

News of Men and Women of the Industry

At a meeting of the Council of the Public Transport Association, Inc., on 9th June, **Mr. R. Birch** retired from the position of chairman, which he had occupied since 1947, and **Mr. J. Watts** retired from the vice-chairmanship which he had held for four years. The new office bearers of the Association are **Mr. G. F. Sinclair,** C.B.E. (chairman) and **Messrs. W. T. James,** O.B.E., and **R. I. H. Longman** (vice-chairmen).

Councillor Arthur Howell, who has been appointed Deputy Lord Mayor of Newcastle-on-Tyne, is a partner in Merz & McLellan, consulting engineers, and has been responsible for the design of large generating stations, including that at Dunston, near Gateshead.

In our last issue we briefly announced the election of **Mr. R. Smith,** Edinburgh, as president of the Electrical Contractors' Association of Scotland for 1949-50. Mr. Smith, who is a prominent member of the contracting industry in Scotland, has taken an active interest in the Association's affairs for many years. **Mr. J. L. Drummond,** the new vice-president, is a former chairman of the Glasgow and West of Scotland Branch of the Association.

Mr. R. Smith

Mr. G. Marson, principal of G. R. Marson, Ltd., is the new president of the Coventry Rotary Club.

Mr. C. Peirson, who for over twenty-five years has been advertising manager for Brown Brothers, Ltd., has retired from active business. **Mr. H. H. Lansdell** has been appointed to succeed Mr. Peirson and **Mr. F. A. Greenslade** is assistant avertising manager.

Mr. and Mrs. Ernest E. Sharp have left this country to live in South Africa, and sailed on 16th June in the *Cape Town Castle*. Their address will be "Andante," Talana Road, Newlands, Capetown. Mrs. Sharp, who, as Miss Veda Brice, was for a time secretary of the London Branch of the E.A.W., was one of the original holders of the E.A.W. Diploma as electrical housecraft adviser. Mr. Sharp was one of the founders of Venner Time Switches, Ltd., and was president of the Electrical Industries Benevolent Association in 1938, after serving as chairman for many years. He is a member of the Institution of Electrical Engineers

Mr. W. H. Darlington, M.B.E., M.Sc., has been granted the degree of Doctor of Philosophy in the Faculty of Engineering by the University of London. Dr. Darlington, who was educated at the Polytechnic and the City and Guilds Engineering College, to which he gained an open scholarship, obtained his B.Sc. degree in 1934, and joined Metropolitan - Vickers as a college apprentice in 1935. After initial employment on condenser work, he became interested in gas turbines, and from 1939 to 1949, under Mr. K. Baumann and Dr. D. M. Smith, was employed on the development of gas turbines for aircraft propulsion. In 1948, he visited Canada and the United States on the company's behalf, and in January last rejoined the Condenser Engineering Department.

Dr. W. H. Darlington

Mr. H. Lockett, A.M.I.E.E., has been appointed electrical sales manager to the St. Helens Cable and Rubber Co., Ltd., to fill the vacancy caused by the death of Mr. F. Allen, and he will take up his duties at the beginning of July. Mr. Lockett received his early training with Callender's Cable and Construction Co., and in May, 1923, he was attached to the Mining Department at Sheffield, where he subsequently became mining sales engineer. He continued in a managerial capacity until the Callender-B.I. merger, when he was transferred to the Home Sales Department at Prescot in control of sales of non-ferrous metals, resistance welding and moulding machines. From 1944 until 1947 Mr. Lockett served as hon. secretary to the South East Yorkshire Branch of the Association of Mining Electrical and Mechanical Engineers.

Mr. H. Lockett

At the annual general meeting of Electroflo Meters Co., Ltd., on 1st June, **Mr. H. R. Walton,** B.Sc., technical sales mana-

ger and **Mr. L. E. Meeks,** works manager, were appointed to the board of directors. **Mr. G. H. Barker,** A.M.I.E.E., sales director, was appointed joint managing director with **Mr. B. Dunglinson,** F.Inst.F., chairman and managing director of the company.

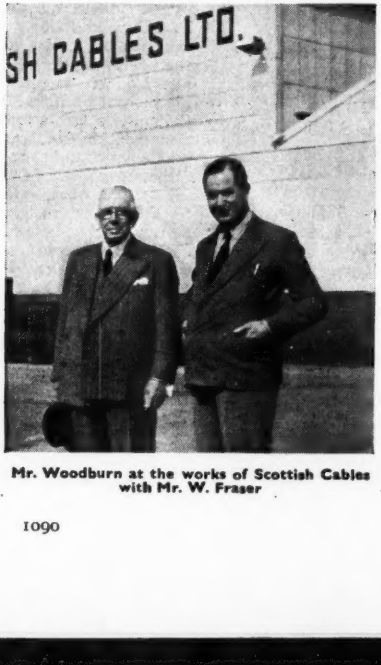
Mr. C. H. Pellow has been appointed manager of the Southern area of the Benjamin Electric, Ltd. He joined the company in 1939 as sales engineer and recently returned from a tour of Australia in connection with the company's export business.

Mr. C. H. Pellow

T. J. Fielding, O.B.E., A.M.I.E.E., formerly assistant marketing manager and technical editor of Bakelite, Ltd., has joined the board of directors of the Technical and General Advertising Agency, Ltd.

Mr. T. G. Evans, previously in the Estimating Department of Brookhirst Switchgear, at Chester, has been transferred to the company's Leeds branch office as assistant to Mr. H. R. Renfree.

Mr. Arthur Woodburn, Secretary of State for Scotland, visited the works of Scottish Cables, Ltd, Deanside, Renfrew, on 16th June. After his tour he addressed the employees and answered questions which they put to him. We reproduce a photograph taken on the occasion, showing Mr. Woodburn with Mr. William Fraser, governing chairman of the company.

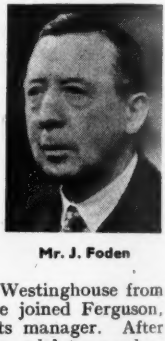


Mr. Woodburn at the works of Scottish Cables with Mr. W. Fraser

Mr. Donald McCullough has been appointed public relations adviser to the Federation of British Industries. The appointment will not prevent his continuing to hold his existing directorships. He will work in collaboration with **Mr. F. L. Stevens,** head of the Federation's Press Department.

Mr. S. Baxter has resigned from the position of works manager of the Rainville Engineering Co., Ltd., and **Mr. C. E. Bacon** has been appointed production manager in his stead. **Mr. K. Paddy** will remain in charge of the works.

Mr. J. Foden, Associate I.E.E., senior assistant transmission engineer, has been appointed transmission engineer, North-Western Division, British Electricity Authority, in succession to **Mr. H. R. Schofield,** Associate I.E.E., who recently transferred to B.E.A. headquarters as transmission construction engineer. Mr. Foden was born in Manchester in 1892, and served his apprenticeship with Ferranti, Ltd. He worked with British Westinghouse from 1912 until 1915 when he joined Ferguson, Pailin, Ltd., as contracts manager. After periods as sales manager and later production manager he joined the Central Electricity Board of the North-West as frequency change engineer, and was later appointed senior assistant transmission engineer, which post he retained after vesting day.



Mr. J. Foden

Tributes to the long service of **Mr. Walter M. Wilcox,** first head of the Huddersfield Technical College Electrical Engineering Department, were paid at a presentation ceremony to mark his retirement, which takes place later this year. His successor will be **Mr. S. Barnett,** of Blackburn. Mr. Wilcox, who became assistant lecturer at the College 36 years ago, was appointed to his present position in 1926. He was born in Sydney, Australia, and was an apprentice with the British Westinghouse Company. Before going to Huddersfield he was for five years a lecturer at the Northampton Polytechnic Institute, London. Mr. F. Bates, superintendent of the Huddersfield power station, presided over the ceremony, and a Nigerian student at the College, Mr. Bruno Gaston, handed to Mr. Wilcox a radio set and a cheque on behalf of past and present students.

Mr. H. W. Oldham, M.A., A.M.I.E.E., in addition to carrying out his duties in the Operation and Maintenance Section of the Chief Engineers' Department, East Midlands Electricity Board, is to act as personal assistant to Mr. A. G. Connell, the chief engineer, and will deal with matters not generally covered by the other section heads. Up to vesting date, Mr. Oldham was technical superintendent with the Mid-Lincolnshire Electric Supply Co., Ltd., and had previously served with the Sheffield Corporation Electricity Department and the Electricity Board for Northern Ireland.

Mr. H. W. Oldham

The Southern Electricity Board has approved the division of the four Sub-Areas (Southall, Newbury, Portsmouth and Bournemouth) into twenty-three districts. So far the following district managers have been appointed, with effect from 1st June: Heston, **Mr. S. H. Fowles,** M.I.E.E., M.I.Mech.E., M.Inst.C.E.; Melksham, **Mr. F. T. Bushroyd;** Oxford, **Mr. J. L. Taylor,** A.M.I.E.E.; Reading, **Mr. J. L. Bates,** M.I.E.E., A.I.Mech.E.; Isle of Wight, **Mr. E. Jordan,** M.I.E.E.; Bournemouth, **Mr. H. W. Sears,** M.I.E.E.

Bylock Electric, Ltd., has appointed **Mr. K. C. Bartlett** to control its Service Department on the resignation of **Mr. H. C. Smith,** who is taking up an appointment in Canada.

The Micanite & Insulators Co., Ltd., announces the appointment of **Mr. A. Harrison,** formerly chief assistant to Mr. F. L. Dineage, manager of the company's Midlands office in Birmingham, to the position of sales representative for Wales and South West England, a temporary office having been opened at St. Martins, Hollybush Road, Cyn Coed, Cardiff (telephone Llanishen 1196). **Mr. G. Brown** has been appointed to succeed Mr. Harrison in the Midlands.

Lt.-Col. Sir Alan Mount, C.B., C.B.E., who is retiring from the position of Chief Inspecting Officer of Railways, Ministry of Transport, on 31st July, has been appointed consultant to the Railway Executive on matters concerned with safety measures for British Railways as from 1st August.

Mr. L. W. Baldwin has been appointed export manager to the Simplex Electric Ltd.

Mr. L. W. Baldwin

This year the **I.E.E. Southern Centre** Summer Meeting is to take place in Sussex on 15th July. Arrangements have been made to inspect the Poling radar station in the morning and the Air Ministry has asked for the names and addresses of all taking part to be submitted by 1st July. Places of interest in West Sussex are to be visited during the afternoon, an eminent archæologist accompanying the parties for the purpose of giving descriptions. Tea will be taken at Hove and there will be time afterwards for those who wish to visit the Brighton Hippodrome.

Last week we reported the presentation by the North Western Electricity Board to an employee, **Mr. J. S. Hill,** to mark his courage in rescuing a child from drowning in a canal. We reproduce to-day a photograph showing Sir Joseph Hallsworth, chairman of the Board, making the presentation, which took the form of a clock.

Sir Joseph Hallsworth making the presentation to Mr. J. S. Hill. Also seen in the photograph are, left to right: Ald. H. E. Rhodes, J.P., Mr. W. E. Swale, Mr. R. A. S. Thwaites, Mr. J. W. Chant, Mr. O. Howarth, Miss N. Kenyon, and Mr. A. Heaton

The annual sports and gala of the London establishments of the **General Electric Co., Ltd.,** were held on Saturday last at the company's Wembley sports ground. A large crowd gathered to witness the fifty-two events, and the fine weather conditions

made this day the most successful since the war from the athletic point of view, while contributing equally to enjoyment of the numerous sideshows and entertainments. The "Leslie Gamage" trophy for the London establishment gaining the most points was won by Head Office The beauty competition was, as usual, one of the principal attractions, and this year's winner was Phyllis Barron (Marconi-Osram Valve Works). A "Crazy Gang" show organized by members of the Research Laboratories wound up the proceedings in the sideshows, subjecting them to the hilarious treatment associated with this type of entertainment. Dancing in the open air and in Hirst Hall concluded the gala. The prizes were presented to the successful competitors by the Hon. Mrs. Leslie Gamage.

Obituary

Mr. R. Robertson, LL.D.—The death has occurred at Carmunnock, Glasgow, at the age of eighty-nine, of Dr. Robert Robertson, who was chairman of the former Clyde Valley Electrical Power Co. and was largely responsible for the planning and technical developments of the company. He gained the B.Sc. degree at Edinburgh University and commenced his career as a civil engineer in Glasgow, becoming senior partner in Strain & Robertson, consulting engineers. For some years he was chairman of the governors of the Royal Technical College, Glasgow, and received the honorary degree of LL.D. of Glasgow University in 1935.

Sir Frederick W. Ogilvie.—The death occurred on 10th June at the age of fifty-six of Sir Frederick W. Ogilvie, Principal of Jesus College, Oxford, and former Director-General of the B.B.C.

Wills

Mr. F. G. Waddington, manager of the Turbine Sales and Turbine Contracts Departments of the Fraser & Chalmers Engineering Works (G.E.C.), who died on 2nd March last, left £14,043 gross (£13,973 net).

Mr. F. N. Husbands, chairman of Concordia Electric Wire & Cable Co., Ltd., left £132,342 gross (£123,188 net).

Cordless Telephone Switchboards

THE design of a cordless switchboard for use in Post Office telephone exchanges has now reached the stage at which final models are being developed incorporating the best features of existing designs. The new switchboards, the first of which is expected to be in operation in 1954 should provide an improved service to subscribers while being less irksome to operators. Although cordless switchboards date from 1932, the Post Office believes that no attempt has previously been made to apply them to so complex a telephone network as that in Great Britain.

Research representatives went to South Africa, Australia, Sweden and the Netherlands collecting information on the subject and high medical authorities were consulted on medical and psychological aspects related to the operation of the machines. The omission of cords from the make-up of switchboards will free designers from a number of restrictions, enabling the operator to control the various keys and press buttons at an almost flat switchboard which, designers consider, will lighten their task and give to them the satisfaction of working in surroundings resembling those in normal commercial offices.

Exports in May

WITH an improvement of £318,592 on the previous month's figures, exports of electrical goods and machinery in May at £10,281,355 were £1,748,800 above those of May last year. They are the third highest figures recorded, being lower only than those of January (£11,417,452) and March (£10,784,608). Of the total, £7,005,037 represented electrical goods and apparatus, which compares with £5,853,189 in May, 1948. While generator exports (£762,405) were only £5,405 above those of the corresponding month of last year, shipments of motors rose from £584,164 to £807,105, exports of "other electrical machinery" increasing also from £1,077,817 to £1,437,926. Imports of electrical equipment during May, totalling £368,238, though £95,296 more than in April, were £6,363 less than in May, 1948. A full analysis of the figures will appear in our next week's issue.

MORE COPIES OF
ELECTRICAL REVIEW

The recent decision of the Government to increase the allowance of paper for technical periodicals makes it possible for more copies of the *Electrical Review* to be available commencing on 1st July.

It will still be necessary for an order to be given to your newsagent or for a direct subscription to be placed with the Publishers.

Additional copies will be limited, so order at once if you wish to be sure of copies regularly.

Electrical Power Convention

Discussions at Torquay

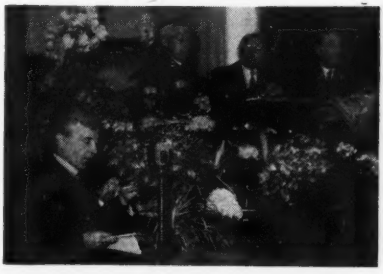
IN our last issue we reported the proceedings at the first British Electrical Power Convention at Torquay and published abstracts of the presidential address by Lord Citrine and the six papers presented.

Mr. T. G. N. Haldane (President of the Institution of Electrical Engineers) proposed a vote of thanks to Lord Citrine (not Sir Vincent de Ferranti as reported last week).

The discussion on the paper by Mr. C. T. Melling (Chairman, Eastern Electricity Board) on "Meeting the Needs of the Consumer in the Electricity Supply Industry" was opened by Mr. R. H. Rawll (N.R.E.I.C.), who said that although he spoke on behalf of the National Register, some of his remarks had application in his other capacity. For the past ten years the industry had had to "back pedal" and the paper was a timely reminder that the main objective of all sections of the industry was service to the consumer. This meant more than mending a hotplate; the consumer must be shown how to get the best out of his electricity supply for the least cost.

Heating was the biggest potential load available and everything possible should be done to obtain it, notwithstanding there were at the moment some technical difficulties. He was wholeheartedly in favour of standard wiring regulations, but one of the difficulties in the past had been the lack of suitable men for inspecting installations.

There must be greater decentralization down to the Districts because it was these people who met the consumers and there were different needs in the different Districts. Those at the bottom should know what was going on at the top.



Mr. T. G. N. Haldane proposes a vote of thanks to the President

Mr. A. M. F. Palmer, M.P. (Employees' National Committee) hoped that,

The picture at the head of this page shows Lord Citrine delivering his presidential address.

coming from a chairman of an Area Board, the paper would do something to dissolve the quaint illusion conveyed by certain sections of the Press—although not by the electrical Press, which had regard to facts—that the British electricity industry was run entirely by remote bureaucrats. There was a scarcity of statistics in the paper as to the general position since nationalization. Just because a report must be given to Parliament during the year, he saw no need for great secrecy in the meantime. He strongly supported the plea for decen-

Mr. C. T. Melling presenting his paper

tralization and said that in 99 cases out of 100 a decision on the spot was better than no decision at all.

He said he regarded the Consumers' Consultative Councils as being, at the moment, in the experimental stage, but they were a brave attempt to guard against the danger that might exist of a public corporation developing into a commercial monopoly. This danger appeared to be very slight indeed in the case of the electricity supply industry.

Mr. H. W. Swann (H.M. Senior Electrical Inspector of Factories), intimating that his great interest was in safety, said that in the past electricity supply authorities had always considered that their responsibility to the consumer went further than supplying electricity and it might be that the Area Boards would now consider that this responsibility went even further than it did before vesting date. Apart from the attention a non-technical consumer might reasonably expect to receive during the lifetime of an installation, there was the question of the initial test and examination and he suggested that more attention on grounds of safety, especially that of fire risk, might now be given to the circuit protection at the main service and on the heavier power circuits.

In addition to protecting consumers' installations, there was the actual state of appliances and, eventually, the question of the age of the installation. Points like these could only be dealt with where the undertaking was prepared to keep in touch with the consumers so that the latter would regard the supply authority as a friend from whom good advice of a reliable and practical character might be expected.

Dame Caroline Haslett (E.A.W.) said that there was a great deal of public goodwill to be regained after the effect of wartime restrictions and the recent blow of the Clow differential, and it would be a hard fight in some cases. She urged electricity supply authorities to arrange for electrical housecraft advisers and other specialists to give lectures in schools and colleges and in domestic science centres and she looked forward to the time when the teaching of electrical housecraft would be universal in schools.

Mr. C. Cameron Kirby (South Eastern Board) said it was essential that a consumer should be able to get all his answers from one person and not have to go from department to department. He suggested the lending of appliances whilst the consumer's own equipment was being repaired and stated that where this policy

The discussion on Mr. Melling's paper opened by Mr. R. H. Rawll

had been adopted it had resulted in increased sales of new and modern appliances.

Referring to the use of electricity on farms, he said that the results so far had been disappointing in cases other than

dairy farming. It was rare to find an arable farm giving a revenue of more than £20 per annum and it was inevitable that the cost per unit should be higher than where the conditions were more favourable. At the same time a low unit cost in itself was not sufficient to expand sales, there must also be hire purchase and efficient maintenance.

Alderman W. J. Bennett (Eastern Electricity Consultative Council) said it was essential that the supply of electricity and the provision of apparatus should be based on a weekly cost.

Mr. W. A. H. Parker (N.R.E.I.C.) said he had recently made a survey of the farms in each Board's area. He found that in the best areas the figure of farms using electricity was between 30 and 40 per cent; there were several areas in which the figure was about 15 per cent and in one instance it was about 9 per cent. To develop this load the capital expenditure must be kept to a minimum, and that was a matter entirely for the Area Boards. Agricultural representatives with a farming background should be appointed. Farmers should also be taken to see electrified farms and get the experience of others in that way.

Mr. W. N. C. Clinch (Controller, Eastern Division) regarded the meter reader as a most important contact with the consumer; he should be able to explain to the consumer all the services that were available and indicate the sources from which information could be obtained.

Mr. R. Birt (N.R.E.I.C.) said that one of the largest potential loads was hot-water storage in conjunction with electric cookers; this would considerably improve the load factor. Another means of improving the load factor was to encourage the use of electric vehicles and Area Boards themselves should utilize these for their own purposes.

Mr. Melling made a very brief reply, and regretted there had not been a more controversial discussion.

Mr. R. A. S. Thwaites moved a vote of thanks to the author.

High Voltage Transmission

THE discussion on the papers by Mr. T. G. N. Haldane, Col. B. H. Leeson, Mr. H. S. Holbrook and Mr. T. R. Scott was opened by Mr. V. A. Pask (chief engineer, B.E.A.), who said that consideration by the supply industry in this country of the case for higher voltage transmission began in 1942 when the Central Electricity Board set up a committee to study the problem. Investigations were made during the ensuing five years and the main conclusions reached were, first, that if generating plant continued to be situated close to the load centres, development at 132 kV would meet all requirements up to about 1960, and, secondly, that uncertainty, particularly as to the future policy of the coal industry and the railways, made it impossible to decide whether it would prove economical to depart from the policy of placing generating plant close to the load centres.

Concurrently with those investigations, the C.E.B. arranged for the erection of two spans of 275 kV line for testing purposes at the research station at Leatherhead. The towers were suitable for carrying lines up to 500 kV. An order had since been placed by the B.E.A. for an experimental section of line designed for 275 kV operation, together with the necessary 132/275 kV auto-transformers to provide a grid connection between a point near Sheffield and Staythorpe, near Newark, a route length of some 40 miles, and construction of this line would begin shortly.

The B.E.A. was continuing the investigations and was now looking further ahead to the conditions which might be expected at some time between 1965 and 1975. There was a growing feeling that the time had come to begin the construction of a superimposed grid in some form. This might be at 132 kV, or at 275 kV average or 300 kV maximum. The economic aspect could not be ignored in the comparison and the prices quoted by manufacturers of 300 kV equipment would have an influence on the final selection.

Although Mr. Haldane had devoted a considerable portion of his paper to developing the case for the interconnection of areas, a reader of the paper would not appreciate the extent to which the existing grid was already fulfilling this function. In fact, the present average capacity of interconnection per area was

320 MW, not very far short of the 400 MW advocated in the paper to deal with a future load more than three times the present. There were limitations at present, notably between the northern and southern halves of the country, but this position would be largely rectified when the Sheffield-Staythorpe line was brought into commission. Appreciable savings in operating costs were also being made through inter-area transfers of energy and in 1948 these were estimated at £265,000.

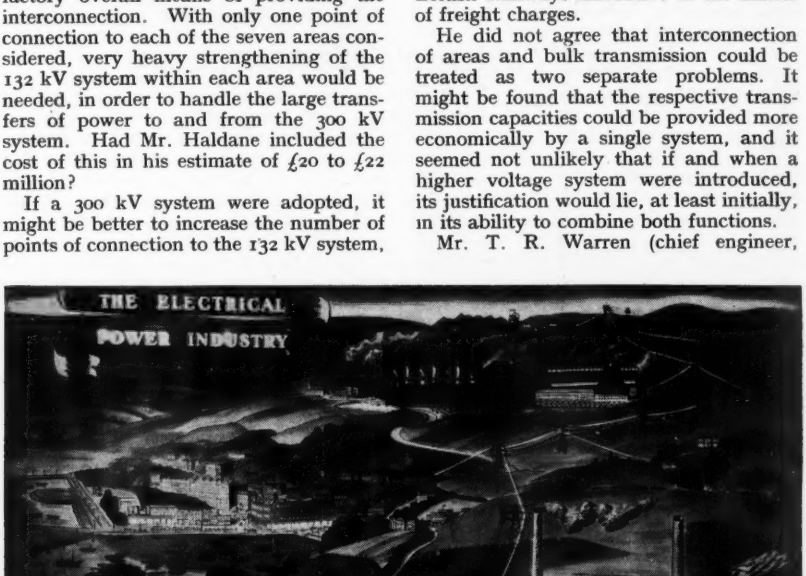
On balance, he accepted Mr. Haldane's figure of 400 MW of interconnection per area as being probably of the right order and he agreed that a flexible system was needed that would permit of such amounts of power to be freely exchanged without unduly affecting the internal operation of the individual areas. He was not nearly so clear, however, that a 300 kV system, on the lines illustrated in the paper, would form the cheapest satisfactory overall means of providing the interconnection. With only one point of connection to each of the seven areas considered, very heavy strengthening of the 132 kV system within each area would be needed, in order to handle the large transfers of power to and from the 300 kV system. Had Mr. Haldane included the cost of this in his estimate of £20 to £22 million?

If a 300 kV system were adopted, it might be better to increase the number of points of connection to the 132 kV system, but a scheme of interconnection by means of heavy current 132 kV lines would also have to be considered and it was by no means certain which of these three methods would prove to be the most economical. While recognizing the value to British manufacturers of gaining experience of higher voltage equipment to enable them to compete in the export market, we could not overlook the duty owing to consumers of electricity here to adopt the cheapest overall satisfactory scheme. Much, therefore, would depend upon the manufacturers and their approach to this matter.

There appeared to be a strong case for the investigation of electrical power transmission in preference to transport of coal by rail. Whether or not it would be economic for the B.E.A. to embark on bulk transmission would depend partly on the cost of the equipment and partly on the policies of the National Coal Board with regard to price structure and of the British Railways Executive in the matter of freight charges.

He did not agree that interconnection of areas and bulk transmission could be treated as two separate problems. It might be found that the respective transmission capacities could be provided more economically by a single system, and it seemed not unlikely that if and when a higher voltage system were introduced, its justification would lie, at least initially, in its ability to combine both functions.

Mr. T. R. Warren (chief engineer,



Diorama displayed at the Convention dinner

South East Scotland Board) said that nationalization had facilitated the common approach to transmission and distribution problems which was so necessary if the best overall results were to be achieved. One very important development along these lines was the work of standardizing system components which was being actively pursued.

Many distribution systems had outgrown the voltage for which they were originally designed. This led to the wasteful use of copper and compelled the introduction of some higher voltage and consequent sub-division of the system. There was invariably some difference of opinion as to the point at which it was necessary to take this step and his view was that the clue was the optimum design of circuit breaker. Therefore, if the grid was to deal with the load increases anticipated during the next twenty years, reactor sectioning would be necessary to a much greater extent than at present and would limit load flows to an extent which would prevent full advantage being taken of the benefits of intercommunication.

To superimpose a super-grid on the existing one in the manner illustrated in Mr. Haldane's paper would increase the fault level in each area to an extent which would entail the provision of a large number of additional 132 kV current limiting reactors and the super-grid would then defeat its own object. This, however, did not invalidate Mr. Haldane's main arguments, but everything depended on the method of putting them into practice.

Future Fuel Supplies

Mr. J. D. Peattie (deputy chief engineer, B.E.A.) said that so far as could be judged at present, most of the electricity required in the next decade or two would be generated by thermal stations using native coal. The need for cooling water restricted the choice of station sites. With regard to the other dominant factor, the supply of fuel, they were on less certain ground. In 1939 the supply industry used about 15 million tons of coal and in 1948 it was practically doubled at 28 million tons. Mr. Haldane's estimate for 1958 would require 47 million tons and for 1968 the figure would be over 90 million tons, which was one-half the present total home consumption for all purposes. In what proportions would that be taken from the country's coal reserves? So far, the Coal Board had not given any answer whatsoever.

From a simple economic point of view there would appear to be a strong case for initial concentration on development of the cheaper coalfields and postponement of development where costs were high. Recent decisions of the Coal Board about deliveries to generating stations appeared to indicate the adoption of such a policy. The East Midland coalfield was supplying the greater part of the increased requirements this summer as compared with last summer. If that policy was confirmed for the future, then there would obviously be a case for the concentration of generation in the East Midlands and adjacent areas, but the problem would again change if the Coal Board related selling prices to the cost of production and treatment and also gave some freedom of choice to coal consumers.

Sea and Rail Transport

Another factor of major importance in the siting of power stations was the cost of fuel transport. For sea-borne supplies the B.E.A. could estimate the cost of shipment in its own vessels but, up to the present, there was no clear idea about the future policy of British Railways. One of the main arguments for adequate interconnection was the resultant pooling of plant margins to meet risks of divergence from estimates of available capacity and actual loads.

Mr. E. A. Logan (Southern Board) said it could confidently be forecast that about 180,000 million kWh would be generated in or about the year 1968. In this country there was a traditional tendency to fix progressive steps in development at too low a figure. There was the opportunity, if the matter was tackled sufficiently boldly, to proceed to the stage which we should have already reached at this time but for the interruption of the war. He therefore seriously suggested that 400 kV should be aimed at. While it might be thought that a limiting factor was the impossibility of forecasting the production on an equal time scale of a satisfactory 400 kV underground cable, a suitably designed system could be wholly over-the-ground, since the terminal points could be clear of built-up areas. Wayleave difficulties alone should

force development of the highest voltage, since it was coupled with the minimum number of physical circuits. There was also greater security against lightning outages and there were no inherent constructional difficulties so far as the overhead line was concerned.

Improved Load Factor

Mr. D. P. Sayers (deputy chief engineer, B.E.A.) said that for the purpose of the investigation which the B.E.A. now had in hand, it had been assumed that there would be a national demand of 30,000 MW between 1965 and 1975. Mr. Haldane's figure of 37,630 MW in 1968 appeared rather high, as did his assumed load factor of 55 per cent. At the same time, he hoped Mr. Haldane was right, as the value of the improved load factor in reducing supply costs could not be over-emphasized. The Area Boards must find means of filling up the valleys in the load curve.

At 132 kV and 70 per cent load factor, electrical transmission was cheaper than coal transport for distances greater than 22 miles. At 275 kV with the same load factor, transmission was cheaper for distances greater than 34 miles. Against sea transport of coal, it was more difficult to compete. The Authority owned a collier fleet and was purchasing more vessels to serve coastal and estuary stations. Development of sea-borne coal facilities would profoundly affect the future prospects of high-voltage transmission in this country.

With regard to the need for area interconnection, Mr. Haldane referred to plant outage due to breakdown of 8 to 10 per cent. Actually, the average outage from all causes last January was 12.1 per cent, made up as follows: breakdown, 5.9; overhaul, 3.1; unsuitable fuel, 1.3; and other causes, 1.9. If the author's figure of 6 per cent was intended to be overall, then it seemed lower than could be expected.

There was need for substantial reinforcement of the existing inter-area tie lines; it was true also that there might be economic justification for heavy capacity lines for bulk transmission, but whatever happened there must be a considerable development of the 132 kV system within each area. Therefore, the question was whether all future requirements could be met by planned extension of the 132 kV system.

To secure an effective increase in route capacity, double circuit 275 kV construction must be used and the larger towers might create new problems in regard to amenities and obstruction to aircraft. The service performance of 275 kV equipment under British climatic conditions had yet to be proved, but it was in the economic sphere that the relative advantages of 132 kV and 275 kV were most keenly at issue. The basis of comparison was not simple, but according to present information the cost ratio of 275 kV to 132 kV equipment was likely to be of the following order on an MVA basis: overhead lines, 0.5; cables, 1.0; transformers, 2.0; switchgear, 1.5. Except for overhead lines, those prospective costs gave no economic inducement to the adoption of the higher voltage. It was difficult for the user to understand the justification for higher prices for 275 kV equipment, as it would be expected that the larger units would show a reduction in cost per MVA. If the excess cost were due to development charges, surely there was the clearest possible case for British manufacturers to get together and coordinate or rationalize their developments to avoid pursuing independently much the same protracted and expensive research.

European Interconnection

Mr. G. R. Peterson (B.E.A. Liaison Office Overseas, Geneva) said that many of the high voltages mentioned in Table 2 were for bulk transmission and were not necessarily an indication of the most suitable voltage for a national busbar. It was now some thirty years since 220 kV and higher voltages had been introduced abroad, but we had not the need to transmit over such long distances. The possibility of establishing a high voltage national busbar was being discussed at the present time in many countries and the possibility of a European high voltage grid was the subject of a detailed study as part of the European recovery plan. The Americans concerned were so convinced that a European high voltage grid would lead to economies in the utilization of power resources that they had recently sponsored a visit of 24 European engineers to the United States to inspect

water power development there. The difficulty so far as this country was concerned seemed to be to prove, before it was constructed, that a national busbar would be an economic proposition. Nevertheless, it was the fact that the success of the national grid in this country had for many years drawn the favourable comment of the whole world. The time might be ripe now for a further step forward to demonstrate again to the world British skill and initiative.

Short-Circuit Problems

Mr. F. J. Lane (B.E.A.) expressed the view that not only would a national busbar offer no solution of the difficult question of switchgear breaking capacity, but it would make the conditions rather worse. The rating of 3,500 MVA implied the interruption of 15,300 A, and it seemed desirable that this should be regarded as a limit for 132 kV. Therefore steps must be taken to restrict the maximum short-circuit duty at points of major concentration of plant. So long as the interconnection continued at the 132 kV level, the natural restriction inherent in the separation of the points of interconnection was of very material assistance.

The 275 kV scheme, however, envisaged circuit conditions which would not ease the short circuit problem nor would the amount of 275 kV equipment required during the next ten or fifteen years, while appreciable, provide a wide enough field for experimentation. It was highly undesirable that the number of types of equipment should be multiplied to the detriment of maintenance, repairs and operating technique.

Throughout the manufacturers' papers the point was made continually that there was no fundamental difference between the 275 kV problems and those at the lower voltages. So it appeared that the differences would be in detail. Such a situation merely transferred to the Authority the invidious responsibility for selection on a basis of minor details, when a much more satisfactory overall solution might have been worked out jointly by the manufacturers and the supply engineers together.

The manufacturers had given evidence that satisfactory designs of equipment were available for operation up to 300 kV. If a higher voltage was necessary, the choice of 275 kV was too hesitant a step to be of long-term value. Yet it seemed to be all that was really possible immediately, having regard to the design, manufacture and commercial considerations involved. The whole picture might be changed if manufacturers and the supply engineers could, in free technical association and as a primary objective, attack the problem.

Mr. F. C. Winfield (Institution of Electrical Engineers) said that while Mr. Haldane was following the well-tried method, the other proposals were not quite clear. He would like to know how it was proposed to control the interchange of power between the areas, which was the weakness in interconnected systems. An interchange capacity of 320 MW rather astounded him; would the control engineer back that? Could he send 320 MW from one area to another when he wanted to, on the average? Personally, he would be surprised to find that the answer was "Yes." Mr. Pask seemed to suggest that with the present system all that was needed was to get the connection between Sheffield and Staythorpe into operation, but personally he regarded connection between England and Scotland and also between the North-East and the Midlands at the present time as too weak.

Long-Range Research

Dr. W. B. Whitney (E.R.A.) spoke of the part the British Electrical and Allied Industries Research Association was playing in problems of higher voltage and said it was encouraging to see from these papers the practical outcome of much long-range thinking. To-day, the Association was still thinking twenty years ahead, but it was hoped that the unrivalled facilities now possessed by many manufacturers for research and development would make it possible to bring new ideas and discoveries to fruition more rapidly than in the past.

There was no reason why a.c. breakers for 300 or 400 or even 500 kV should not give as good and reliable service as the many excellent breakers for lower voltage now in use. However, he was not satisfied that 66 kV per break was the upper limit for air-blast breakers. It should be possible by suitable design of nozzle and gap to raise it.

Mr. C. W. Marshall (deputy chief engineer, B.E.A.) said that higher voltage transformers would be, to all intents and purposes, immune from lightning hazard. The climate hazard was a much more insidious thing and in certain industrial areas they had occasionally encountered conditions which demanded attention. That was why he recommended caution in going beyond 300 kV. As regarded discriminating protective gear, with very high-power circuits the present-day standard of 95 per cent was not good enough. It was possible to obtain 100 per cent on any system and when the money was forthcoming it should be possible to provide apparatus which would clear the few faults that would occur on very high voltage systems.

From his experience of foreign practice he knew that supply engineers abroad were envious of the extraordinary reliability of large British transformers. There was, however, a difficulty about price which often did not enable us to compete. It would be interesting to have records of the reliability of foreign-made transformers. Although high voltage d.c. had been mentioned, he did not think it was yet possible to contemplate large-scale application.

Mr. R. M. Charley (English Electric Co.) said we had been negligent in this country in not advertising the achievements of British transformer makers. He gave details of many large units sent overseas from as far back as 1910 and said that in that way British makers had accumulated a large amount of valuable experience of high voltage operation before it was needed in this country.

Mr. Pask had mentioned that transformers in the 300 kV class which had been ordered were comparatively simple for British makers to build. They were 120 MVA three-phase units, auto-connected for a ratio of 275/132 kV. British makers were also producing very much more complicated units. They were large and very expensive, the price being £150,000, but he asked them not to divide the £150,00 by the MVA mentioned in Mr. Holbrook's paper in order to get at the price per MVA, because that would be meaningless. Without complete information of all the factors involved, it was impossible to judge from the cost per MVA whether the price was right or not.

There were some possible applications of high voltage d.c. which would be forced on engineers within the next few years, particularly in connection with under-sea power transmission. There were such cases even round the British Isles which might be desirable.

The President asked a number of other speakers, owing to lack of time, to communicate their comments. The authors replied briefly to the speakers and promised full replies in writing.

The Contractor's Future

THE discussion on Mr. P. G. Wallis's paper on "The Electrical Contractor's Place in the Industry and His Service to the Public" was opened by Mr. F. W. Purse (hon. director, National Register of Electrical Installation Contractors).

Mr. Purse said that the author had trailed his coat rather widely, and probably intentionally. Mr. Wallis had set out the case of compulsory registration of contractors but there was much to be said on the other side. Advocates of voluntary registration were now in a stronger position than ever before.

Dealing with the question of shoddy work (he objected to the term "shoddy") Mr. Purse said that manufacturers, contractors, their operatives and the electricity supply authorities were all responsible for its existence. The manufacturers were to blame for placing in the contractors' hands fittings and materials which did not comply with the I.E.E. Regulations. In this respect the E.D.A. Proving House might do good. He said that in 1946 he wrote to B.E.A.M.A. on this matter and after considerable delay had received the inconclusive answer that it would take some time to secure practical results, although the I.E.E. Regulations had been in existence for many years.

Earthing means were often totally inadequate. The Electrical Research Association had tested clamps of all designs and the British Standards Institution had issued a specification in February last, yet

not a single manufacturer had produced one to this specification.

He could not accept the author's implied claim that all E.C.A. members were angels and all other contractors "untouchables." He was certain that if the work of all the members was tested not 10 per cent. would come out with a clean sheet as regarded the I.E.E. Regulations.

He did not want it to be thought that all contractors were a bad lot. They were anxious to do good work but were hampered by the actions of their operatives. It was no encouragement when supply authorities connected defective installations.

Mr. F. W. Purse opening the discussion on Mr. Wallis's paper

As to the operatives, he was sorry for them. There were supposed to be apprenticeship schemes but generally the training consisted largely of being attached to wiremen who could not give the proper training. Both supply authorities and contractors drew their men from the same group. The B.E.A. should have a permanent school for wiremen giving a simpler course than the City and Guilds syllabus.

Mr. Melling had stated in his paper that the supply authorities (the Area Electricity Boards) could not compel the adoption of the I.E.E. Regulations and had to connect installations which did not comply with them. He did not agree. The Electricity Commissioners (in consultation with the I.E.E.) ruled in 1937 that an undertaking should not give or continue to give a supply unless installations were safe and adequate for the purpose for which they were designed. It was provided that any installation complying with the I.E.E. Regulations would be deemed to comply with the Commissioners' requirements.

The supply authorities had taken the view that they were compelled only to make an insulation test. Many did not want the cost of installation work increased as they wanted to sell electricity. Why did the Electricity Commissioners not make the rules mandatory? It was because all regulations must be rigid to some extent and tended to retard progress. Mr. Purse quoted "Pyrotenax" cable and the "Wylex" flat-pin plug as examples of good equipment which did not conform to I.E.E. Regulations and would have had to be rejected if the Regulations were compulsory. He did not ask for compulsory I.E.E. Regulations but he stressed the point that supply authorities had the power to refuse to connect unsatisfactory installations.

Mr. E. A. Fowler (Eastern Electricity Board) said that the contractors had played, and would continue to play, an important part in the industry. The Electricity Boards had inherited businesses which made them large contractors. These were not new departments; they had already made a big contribution to development. He thought that the electrical contractors had more to fear from multiple stores than from their colleagues in the electricity supply industry.

Some of the largest contracting firms had some form of manufacturing business which supplemented their contracting work. They had absorbed the businesses of small firms which could not operate efficiently without adequate resources.

Making Services Pay

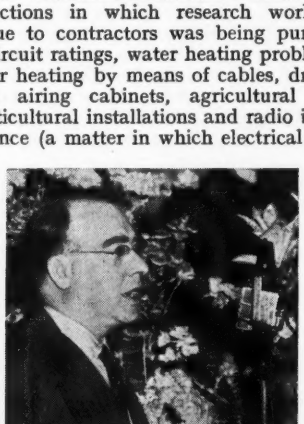
Lord Citrine had drawn attention to the enormous capital expenditure which the electricity supply industry had to incur during the next few years and it was clear that regard must be paid to the utilization factor and full contact maintained with the consumers. It now cost three or four times the pre-war amount to provide services, and so the utmost must be obtained from them.

Electricity service centres would have to institute repair services and hiring facilities which the private contractor would find it difficult to provide. There would be plenty of work for both contractors and Boards and success would be

achieved by both if the best features of the papers by Mr. Melling and Mr. Wallis were adopted.

Dr. S. Whitehead (director, E.R.A.) said that until recently manufacturing successes had come without much research, but now it was most important. Contractors had benefited by co-operative research in a number of directions. He had found that the United States was behind this country in research on the rating of conductors. They were trying to maintain this lead in co-operation with the I.E.E. An attempt was being made to relate earthing and the safety of consumers to the cost of installations, and it was hoped to report results soon.

Dr. Whitehead mentioned a number of directions in which research work of value to contractors was being pursued —circuit ratings, water heating problems, floor heating by means of cables, drying and airing cabinets, agricultural and horticultural installations and radio interference (a matter in which electrical con-



Dr. S. Whitehead speaking on the paper by Mr. P. G. Wallis

tractors must accept some responsibility). Consumer reactions had been dealt with scientifically and much good had been done in the way of quality control. The supply industry had provided most of the stimulus for this work, and he hoped that it would be amplified.

Mr. R. A. S. Thwaites (chairman of E.D.A.) spoke of the importance of electronics, and in this connection mentioned the work of Oliver Heaviside, for some years a resident in Torquay. He thought that this link between Heaviside and the Convention should be placed on record.

Mr. H. Nimmo (chairman, Southern Electricity Board) said that the last section of the paper was the most important but it should have been headed "Co-operation, Collaboration and *Fair* Competition with the British Electricity Authority." The author seemed to be afraid of the planning of installation work on a "vast scale" by the Electricity Boards, but he (the speaker) saw no sign of this. The Boards' installation powers were not new. They certainly could not shut down the departments which they had taken over until the power position was secure, as the author had suggested.

Mr. Nimmo emphasized the fact that the new system was not State trading. He hoped that their contracting departments would be most enterprising, but competition would be absolutely fair. If the private contractor justified himself there would be room for both in the expanding industry.

The Consumer's Voice

Alderman W. J. Bennett (Eastern Consultative Council) claimed to be the early voice of the public which Mr. Wallis said was going to determine who should survive and who should fall by the way. There seemed to be too much complacency in the paper. Nationalization was inevitable and the public wanted to see the spreading of overhead charges over a large organization, whether electricity supply or contracting. The small man could not now compete with large bodies. It would not do to make the world safe for the contractor—it would cramp his initiative.

Mr. Wallis had suggested that the Boards should make more profits which could be used to reduce taxation. That would not do: profits must be reflected in reduced costs for all their services. Once the contractors were acclimatized to the new atmosphere they would find that they were able to exist and continue to serve the public.

Mr. H. F. Carpenter (secretary, B.E.A.) said that before he was "nationalized" he was with a very much smaller undertaking which had happy relations with contractors with whom the undertaking did not compete. They drew up together specifications and methods and set them out in clear agreements.

Passing over the doubt whether Parliament would agree to compulsory registration, Mr. Carpenter deprecated the way

in which the case for compulsion was put over. Electricity caused fewer accidents in the home than any other agent. Most electrical accidents were due to defective appliances or occurred in bathrooms; they were seldom due to the wiring.

He thought that compulsion would actually increase danger because the "hordes" of inefficient contractors would be swept into the net of registration and be enabled to carry on. It had been said that all the bad practitioners would be weeded out in ten years; much harm could be done in that long period. There should be constant publicity to persuade the public to employ only E.C.A. members or registered contractors; that would produce the best results.

Mr. Wallis, in reply, said that he would have to write another paper to deal with all Mr. Purse's points. He entirely refuted Mr. Purse's suggestion that only 10 per cent of the E.C.A. membership would come out from a test with a clean sheet; only about 0.01 per cent would fail the test. He also disagreed with his remarks on apprenticeship; this was one of the earliest features of the E.C.A.'s work. While the electricity supply authorities might have had powers to refuse to connect inadequate and unsafe installations, most of them did nothing about it. He insisted that he had evidence that the Electricity Boards *were* going into contracting work in a big way. Multiple trading concerns did not worry the contractors; compulsory registration would get rid of them. He did not agree that the Boards would have smaller overhead charges. They were unable to get down to E.C.A. prices now and would be unable to do so for many years.

From the speeches which had been made he had derived a sense of security against unfair trading. He agreed that the dangers of electricity should not be stressed; the accent should be on the necessity for safety. With regard to Mr. Carpenter's remark, every fisherman caught fish which he did not want and he just threw them back into the sea. So would it be with compulsory registration.

Dame Caroline Haslett (director, E.A.W.), in moving a vote of thanks to the author, paid tribute to the work of the pioneers of the contracting industry and said that good contractors could be assured of full co-operation on a fair basis in the carrying out of the immense amount of business which was to be done.

E.A.W. Luncheon

THE Dowager Lady Swaythling (president), took the chair at the luncheon arranged by the Electrical Association for Women at the Grand Hotel, Torquay, on 16th June. Lady Swaythling said that for over thirty years this luncheon had been held in connection with the I.M.E.A. Conventions. She confessed that the new titles and initials greatly puzzled her.

Mrs. A. B. Lewis, J.P. (chairman, E.A.W.), proposing "The British Electrical Power Convention," said that the E.A.W. were proud to be at the Convention for the first time as official delegates.

At the E. A. W. Luncheon

Left to right: Mr. H. F. Carpenter (Secretary, B.E.A.), Mrs. A. B. Lewis, J.P. (Chairman, E.A.W.), the Mayor of Torquay, the Dowager Lady Swaythling (President, E.A.W.), Lord Citrine, Mrs. A. E. MacColl (Chairman E.A.W. Scottish Council), the Mayoress of Torquay and Mr. E. W. Bussey (B.E.A.)

Among the members of the Consultative Councils were fifty women, many of them members of the Association, who possessed valuable knowledge of consumers' needs. She hoped they and the Boards would recognize the value of electrical housecraft advisers.

In the course of a witty reply, Lord Citrine said that he admired the way in which women reached speedy conclusions, even if they were not always the right ones. Women's critical faculties were highly developed. He pointed out that the E.A.W. was now an inherent part of the Convention and was bound to have a considerable influence on Convention policy. Last year it had been decided to continue the function for one year only, but he was prepared to wager that there would be a Convention next year, in a much more cohesive form. The Convention would become a great force in the industry and in the task of lightening the people's burdens to give them a greater opportunity of living a fuller life.

Mrs. A. E. MacColl (chairman, E.A.W. Scottish Council), proposed the health of the guests in a charming speech, and the Mayor of Torquay (Ald. F. J. March), responded.

Convention Dinner

THE Prime Minister (Mr. C. H. Attlee) was the guest of honour at the Convention Dinner held at the Grand Hotel, Torquay, on 16th June. Lord Citrine presided over a company limited by space considerations to 316.

Proposing the toast of "The Electrical Power Industry," Mr. Attlee said that for some years he was chairman of the Stepney Electricity Committee and vice-chairman of the London and Home Counties Joint Electricity Authority. Although his close connection with the supply industry ceased over 20 years ago, he had always continued to take a lively interest in its progress. He was glad there had now come into existence an organization which embraced all sections of the industry. The transfer of the industry to the British Electricity Authority had been effected with a smoothness and lack of friction which reflected the greatest credit on all concerned. For the first time it was possible to plan the layout of the industry both nationally and regionally.

Lady Citrine, the Prime Minister and Lord Citrine at the Convention dinner

When the war ended there were great arrears to make good, while technical developments in industry, the demand for electrical equipment in the homes of the people and, above all, full employment had resulted in an enormously increased demand. He knew how hard all those concerned in the production of plant and equipment had worked to make good these deficiencies, but new generating plant took time to come into commission. At the same time, it was necessary to maintain some export, in view of the economic position of the country, and this industry could make a great contribution to our balance of payments.

He knew, too, something of the fuel difficulties that had faced electrical engineers when they had to make do with a different sort of coal from that which they would have desired. Nevertheless, the industry must be congratulated on what it had done and its readiness to do everything possible to help. He was very glad to see that, with the co-operation of the National Coal Board, the loss of capacity directly attributable to these difficulties had been greatly reduced and,

at the same time, the efficiency of a large number of power stations had been substantially increased. While electricity sent out during the year ending 10th June last was 12 per cent more than in 1947, the amount of coal consumed was only 8½ per cent greater, a saving of nearly one million tons of coal. There was yet a long way to go before power production would meet the demand, and there was, of course, all the time the need to replace obsolete plant.

Referring to hydro-electric developments, he said he had regular progress reports laid before him, and here was an outstanding instance in which, by harnessing the water power of this island, we could make a great increase in the national wealth. The electricity supply industry had a great wealth of technical ability at its disposal, and he was confident that it would go from strength to strength. Those engaged in it knew they controlled an instrument of vital importance to the economic life of the country and also one that could lighten the burdens of the workers in industry, and especially of the women in the home.

At the conclusion of the Prime Minister's speech, a large illuminated diorama was uncovered and was seen to represent Torquay and its surroundings with the Newton Abbot power station and transmission lines illuminated. A picture appears on page 1096.

Lord Citrine, responding to the toast, said they were honoured by the presence of the Prime Minister, and added that they were grateful for the removal of the restrictions that had made possible the illuminations on the sea front at Torquay. and similar places. But more power was needed, not only in the domestic sphere but industrially. Our workers were labouring under the handicap of having at their disposal about one-third the horsepower that the workers in America had, and everybody hoped that this difference would be reduced in the next few years. He appealed to the Government to help by way of allocation of materials and labour. There was no hope of our overtaking the arrears and taking the lead unless permission was granted to raise the B.E.A. programme beyond the 1,500 MW which had so far been laid down by the Planning Committee and the Economic Secretariat of the Government.

A group at the dinner including Mr. E. G. Batt and Dame Caroline Haslett

The Prime Minister was regarded as a friend of the industry, and it was hoped that he would use his influence so that the programme could be brought up to the level that was so demonstrably necessary in order to provide our people with the electricity they needed and should have. He knew that Mr. Gaitskell, the Minister of Fuel and Power, was fully convinced of the necessity for doing what he had just mentioned, and therefore he left it at that and asked for the help of the Prime Minister in the matter.

At this stage, the Dennis Golf Trophy was presented to the winner of the competition, Mrs. G. N. Green. The President announced that the funds of the Electrical Industries Benevolent Association would benefit to the extent of £18 as a result of the golf competition.

Lady Citrine then asked the Mayoress to accept an electric warming plate as a mark of apprecition of what the Mayor and herself had done in entertaining the delegates during the Convention.

Sir John Dalton then proposed the toast of "Our Guests," and coupled with it the name of the Mayor of Torquay,

Alderman Frank J. March. The Mayor, in the course of his reply, said that Torquay, like many other places, had been loth to part with its electricity undertaking, which had been built up from a very small concern to assets, when it was taken over, of well over £1,000,000. There were certain liabilities, but nothing worth mentioning. The undertaking covered some 450 sq miles, and supply was given at prices which compared favourably with those of other undertakings of similar size. He paid a tribute to their late engineer and manager, Mr. George Hollyer, now a sub-area manager in the South-Western area.

General Meeting

THE concluding item in the Convention programme was the first annual general meeting of delegates. The proceedings were opened by Lord Citrine, who said that this first Convention was an experiment and it was now to be decided what was to be done in the future. Rules of the Convention had been circulated and as no notice of amendment had been received they seemed to be generally accepted. Rule 3 provided that the Convention should be held annually; thus, continuance of the Convention was assured. He was certain that everybody present, whatever doubts there may have been, felt that the Convention should go on and provide an opportunity of renewing friendships and making new contacts in a free and friendy atmosphere.

Col. B. H. Leeson (B.E.A.M.A.), in moving that the Convention should be continued, said that the gathering had established a marvellous liaison between the nationalized body and other sections of the electrical industry. The motion was seconded by Mr. P. V. Hunter (N.R.E.I.C.) and carried unanimously.

Mr. J. Eccles (Chairman, Merseyside and N. Wales Board) moved the adoption of the rules; Dame Caroline Haslett seconded the motion, which was also carried unanimously.

Upon the proposition of Mr. V. A. Pask (chief engineer, B.E.A.), seconded by Mr. R. Lee (London Board), standing orders for the regulation of proceedings at annual general meetings were approved.

The next business was the election of a president for the ensuing year, and Lord Citrine said that there was unanimity among the Council that Sir Vincent de Ferranti should be his successor. He not only bore a name universally honoured in the electrical industry, but had made important contributions to the industry himself. Sir Vincent de Ferranti's election to the position was approved unanimously.

In thanking the delegates, Sir Vincent said he was very conscious of the difficulty of following such a wonderful chairman as Lord Citrine. There might be differences of opinion as regarded nationalized bodies, private monopolies, etc., but it was the man at the top who counted. Lord Citrine's work would have a profoundly beneficial effect upon the electrical industry.

Nominations to the Council for the ensuing year were then approved. They are as follows; where a deputy has been nominated his name is given in parenthesis:—

Association of Consulting Engineers, J. R. Beard.
British Electrical & Allied Industries Research Association, R. Lee.
British Electrical & Allied Manufacturers' Association, Col. B. H. Leeson (Hon. J. R. Rea).
British Electrical Development Association, R. A. S. Thwaites (V. W. Dale).
British Electricity Authority and Area Boards, Sir Henry Self, V. A Pask, F. W. Lawton, J. Eccles, C. R King, H. J. Randall, S. F. Steward.
British Refrigeration Association, E. G Batt.
Cable Makers' Association, Sir John Dalton.
Electric Lamp Manufacturers' Association, W. J. Jones.
Electrical Association for Women, Dame Caroline Haslett (Miss V. Norvick).
Electrical Contractors' Association, L. C. Penwill (J. G. Briggs).
Electrical Wholesalers' Federation, A. B. Wildsmith.
Employees' National Committee, J. F. Wallace (F. Foulkes).
Institution of Electrical Engineers, C. M. Cock (W. K. Brasher).
National Register of Electrical Installation Contractors, P. V. Hunter (F. W. Purse).
North of Scotland Hydro-Electric Board, J. M. Erskine.
Electricity Undertakings in Northern Ireland, W. J. McC. Girvan (A. W. Ferguson).
Water-Tube Boilermakers' Association, K. J. McKillop.

After the election of auditors on the proposition of Mr. E. G. Batt (B.R.A.),

seconded by Mr. W. J. Jones (E.L.M.A.), Lord Citrine moved an "omnibus" vote of thanks to those who had contributed to the success of the Convention. He particularly mentioned the Mayor of Torquay, the ex-Mayor, Corporation and officials; Mr. G. J. Hollyer, formerly borough electrical engineer, Torquay, and now sub-area manager; Mr. N. Boydell (S.E. Board), who prepared the symbolic backcloth to the platform; the electrical Press; Mr. J. W. Simpson, secretary of the Convention; and the members of the Council.

Lord Citrine said that the remarkable help he had received had made the past year or two the happiest period of his life. He asked the delegates to extend to Sir Vincent de Ferranti the same friendly co-operation.

Mr. J. Eccles expressed the delegates' heartiest thanks to Lord Citrine. Everybody must have realized his competence and confidence at the business and social functions of the Convention. Inspiration had been derived from him by the Council throughout the year. Mr. Eccles concluded with a graceful tribute to Lady Citrine, who had so ably supported her husband.

Mr. P.V. Hunter, in seconding the vote of thanks, said that some had realized for the first time that they had had the

Sir Vincent de Ferranti thanks delegates for his election as President

ideal chairman for the Convention. With Lord Citrine the manufacturers felt that they were in entirely safe hands.

The vote was enthusiastically accorded, and Lord Citrine, in the course of his response, voiced his affection for and appreciation of his wife. They had together determined, he said, that whatever their circumstances might be they would never depart from their earlier ideals.

N.A.L.G.O. in Electricity Supply

THE many problems with which the National Association of Local Government Officers was confronted in the reorganization of its branches and the introduction of new salary scales were outlined by Mr. L. G. Moser, organizing officer for electricity staffs, addressing delegates from electricity undertakings at a meeting in Aberdeen on 13th June, before the opening of the annual conference of N.A.L.G.O.

Mr. Moser said that there were now some 250 electricity branches. The National Joint Council had been regularly meeting and the District Joint Councils and staff committees had been regularly doing their work. New general division salary scales had been introduced which, although not ideal, gave a large number of people some very solid financial advantages. There was also an extended scheme which had increased the pay of many electricity members, and a sick pay scheme, as well as a holiday agreement.

Although the extended scheme had brought advantages, they had not got all they wanted. In the present stage of the industry with all the reorganization going on there was, for instance, a very good claim for overtime payment above the general scale. Mr. Moser warned the delegates, however, that they might lose in other directions if they pressed this question too hard.

Although there was negotiating machinery for administrative and clerical grades, manual workers and technical staff, they were still without that machinery for the managerial people. The original idea of the British Electricity Authority was that there should be only one organization representing the managerial staff. After negotiations on demarcation they had had to admit this was not going to be done on purely functional grounds. They had also difficult problems of demarcation within the machinery that already existed, but he was quite certain they would be able to solve them in a satisfactory way.

Mr. Moser said they had come to the conclusion that the Association could not get a permanent salaries agreement before 1st April, 1950.

United States Electrical Exports

DECLINE IN 1948

EXPORTS of electrical machinery and apparatus from the United States last year totalled approximately $491 million in value compared with $563 million in 1947. This decline was spread fairly uniformly over the main groups, exceptions being distribution transformers, motors (1-200 h.p.), locomotives and refrigerators.

Class of Goods and Destinations	1948 $(000)	Inc. or dec. on 1947
Generators, d.c.	1,497	− 1,018
To Canada	607	+ 201
,, *Mexico*	202	+ 33
,, *Brazil*	89	− 56
,, *India*	55	− 53
,, *Argentina*	130	− 275
Generators, a.c.	3,458	+ 227
To Mexico	636	+ 323
,, *Colombia*	115	− 91
,, *Brazil*	1,026	+ 1,717
,, *Argentina*	122	+ 16
,, *Norway*	148	+ 144
,, *Canada*	447	+ 21
Steam turbo-generator sets, 500 kW and over	8,328	− 1,866
To Mexico	1,420	− 957
,, *Colombia*	587	+ 424
,, *Venezuela*	770	+ 398
,, *Canada*	581	+ 312
,, *Argentina*	1,754	+ 142
Diesel elec. generating sets	22,722	− 3,096
To Canada	1,019	+ 215
,, *Mexico*	1,584	− 1,276
,, *Venezuela*	1,657	+ 392
,, *Brazil*	2,287	+ 135
,, *Argentina*	3,019	− 1,832
,, *India*	1,135	− 97
,, *Union of South Africa*	1,183	+ 735
Power transformers, over 500 kVA	4,923	− 2,183
To Mexico	776	− 368
,, *Brazil*	1,101	− 26
,, *Venezuela*	260	+ 84
,, *Chile*	348	+ 257
,, *India*	362	+ 283
Distribution transformers, not over 500 kVA	5,172	+ 1,607
To Colombia	393	+ 157
,, *Mexico*	1,370	+ 252
,, *Venezuela*	503	+ 345
,, *Argentina*	118	+ 42
Power switches, circuit breakers over 10 A	11,841	+ 2,389
To Canada	2,445	+ 381
,, *Brazil*	899	+ 293
,, *Mexico*	1,328	+ 163
,, *Venezuela*	468	+ 93
,, *Colombia*	482	+ 291
,, *Argentina*	407	+ 66
Mercury power rectifiers	345	− 665
To Canada	117	+ 105
,, *Brazil*	112	− 343
,, *India*	29	− 4
Complete battery chargers, non-rotating	535	− 936
To Canada	120	− 80
,, *Brazil*	49	− 93
,, *South Africa*	30	− 183
Self-contained lighting sets	6,002	− 2,679
To Canada	1,361	+ 216
,, *Brazil*	518	− 409
,, *Mexico*	667	− 269
,, *Venezuela*	915	+ 53
,, *Argentina*	333	− 431

Class of Goods and Destinations	1948 $(000)	Inc. or dec. on 1947
Convertors	2,904	− 68
To Brazil	574	+ 369
,, *Argentina*	208	− 319
,, *Belgium*	174	+ 136
Motors, stationary, 1–200 h.p.	15,627	+ 2,148
To Canada	1,567	+ 181
,, *Mexico*	2,045	− 35
,, *Brazil*	1,204	− 260
,, *U.S.S.R.*	797	+ 9
,, *India*	1,322	+ 742
Locomotives, railway, mining, etc.	6,026	+ 2,300
To Canada	644	+ 252
,, *Brazil*	2,981	+ 1,997
,, *U.S.S.R.*	226	− 973
,, *Poland*	297	+ 297
Flashlight batteries	6,030	+ 315
To Mexico	356	− 213
,, *Venezuela*	697	+ 264
,, *Colombia*	442	+ 322
,, *Brazil*	930	+ 376
Refrigerators, household	41,470	+ 1,842
To Belgium	1,506	+ 778
,, *Venezuela*	4,399	+ 2,283
,, *Brazil*	7,638	+ 1,006
,, *South Africa*	7,696	+ 3,331
,, *Malaya*	902	+ 343
Lamps, small, filament	4,274	− 639
To Canada	532	− 322
,, *Argentina*	566	− 151
,, *India*	174	− 70
,, *Australia*	173	− 65
Lamps, large, filament	2,999	− 1,502
To Colombia	173	− 65
,, *South Africa*	141	− 133
,, *Mexico*	154	− 3
,, *Venezuela*	244	− 16
,, *Chile*	202	+ 37
,, *Poland*	137	+ 75
Electric washing machines	7,308	− 3,676
To Argentina	1,185	+ 352
,, *South Africa*	1,902	+ 1,313
,, *Mexico*	470	− 852
,, *Venezuela*	949	+ 582
,, *Switzerland*	526	+ 313
Electric flat irons	1,581	− 1,347
To Venezuela	218	+ 1
,, *Mexico*	165	− 413
,, *South Africa*	187	+ 124
,, *Argentina*	200	− 171
Heating and cooking devices, domestic	5,034	− 1,109
To Canada	2,344	+ 179
,, *Mexico*	377	− 215
,, *Venezuela*	224	+ 2
,, *South Africa*	354	− 35
Wiring supplies and line material	5,279	+ 170
To Canada	1,514	+ 306
,, *Mexico*	392	− 22
,, *Brazil*	305	− 105
,, *Venezuela*	417	+ 87
,, *South Africa*	334	+ 86

COMMERCE and INDUSTRY

Power Station Strike Threat : Thames Radio Service

MR. F. FOULKES, president, Electrical Trades Union, has sent a circular letter to members referring to reports that strike action is contemplated by the combined Works Committee of the London generating stations of the British Electricity Authority. It is stated that the men fear that their wages will be reduced by a new agreement reached with the B.E.A. Mr. Foulkes says that no worker within the industry will suffer a reduction due to the recent negotiations, and workers on a bare 44-hour week will gain 5s 6d, providing they were on the bare scheduled rate. The rotating shift workers will gain 18s 6d a week. Some bonuses will form the subject of discussion on a district basis. The circular states that until such discussions take place, and until agreement is reached on these bonuses, no strike action could possibly be justified.

About 650 workers at the Brimsdown power station have been threatening to strike on account of anomalies that have arisen through the introduction of the new wages agreement. Since 1945 they have been paid a bonus of 7½ per cent for working in abnormal conditions. It is contended by the British Electricity Authority that the bonus was an "excess rate" and as such should be merged with the new 1½d an hour rise for all power workers. A similar bonus was paid before nationalization at the Barking station. These grievances, together with others from Battersea, Fulham and Deptford power stations, were down for discussion at a meeting of the No. 1 (London) District Joint Industrial Council on Wednesday.

Patents and Trade Marks in 1948

A decrease in the number of applications for patents filed during 1948 is recorded in the sixty-sixth report of the Comptroller-General, Mr. J. L. Blake, published by H.M. Stationery Office, price 6d. Applications for patents numbered 33,626; for designs 5,725; and for trade marks 10,326. Comparable figures for the previous year were 35,378, 5,463 and 10,365. As the extended period for filing wartime arrears of applications under the Neuchatel Agreement expired on 31st December, 1947, this decrease was to be expected, the Comptroller says. Progress in the training of new staff is reflected in the increase in the number of patents sealed (from 11,727 in 1947 to 15,558 last year) and trade marks registered (from 4,476 to 7,397), but there are still heavy arrears of work and a further examination for assistant examiners is being held this summer.

New Zealand Lighting

At the Wellington branch of the Bank of New Zealand a fluorescent lighting installation has recently been completed employing twin-lamp fittings each illuminating an

B.T.H. fluorescent lighting in the Bank of New Zealand, Wellington

area of 125 sq ft. A total of seventy units is used, the fittings being specially developed by the B.T.H. agents in New Zealand and designed for use with two "Mazda" 80 W fluorescent lamps side by side. A cover box is incorporated at both ends of each fitting, serving both to house the control gear and act as a flicker shield. The mounting height is approximately 20 ft and the installation gives an average illumination level of about 25 lumens per sq ft over the whole area.

Television Aerial System

The sound and vision aerial system for the Sutton Coldfield station of the B.B.C. television service, which has been manufactured by Marconi's Wireless Telegraph Co., Ltd., to B.B.C. specification, is now under-

going tests at Chelmsford. This aerial system comprises eight dipoles which are fed by both the vision and sound transmitters through a combining unit. In this way the single aerial system is used without mutual interference between the two transmitters.

Under test the arrangement has been loaded with 35 kW vision and 12 kW sound power. An integral part of each of the dipoles is a system of channelling designed to carry away rain and, in order to test this system, the aerial array has been fully loaded with sound and vision power and a Fire Service hose used to play water over the whole structure for a long period. It has thus been subjected to a downpour, far in excess of anything it is ever likely to encounter after erection, with complete success. At Sutton Coldfield this aerial system will be mounted at the top of a 715ft mast.

Ruskin's House Wired

An interesting note in the June issue of *Areatopics,* the staff magazine of the North Western Electricity Board, records the wiring by the Board of Brantwood, where John Ruskin spent the last thirty years of his life. The house, on the shores of Coniston Water, is now owned by Mr. J. Howard Whitehouse, a noted educationist. It is to become available to the public and is also to be a reading centre for schools. The electrical installation just completed comprises 140 points, together with a double oven range.

Telephone Cable Pillars on Footpaths

Early this year Hampstead Borough Council received a request from the North-West Area, London Telecommunications Region, for consent to the placing of cable distribution cabinets and pillars on footpaths, and supplying details of the number proposed to be erected during the next ten years. The matter was raised with the Metropolitan Boroughs Standing Joint Committee, which has expressed the opinion that, in general, there should be no departure from the well-established practice of placing this apparatus underground.

Gas Delegates at Lamp Works

A party of delegates to the Fourth International Gas Conference, which was held in London during last week, visited the Osram-G.E.C. Glass Works and Lamp Works at Wembley on 16th June. The conference, organized by the International Gas Union, was attended by delegates of 22 countries, and representatives of France, Belgium and Holland were among those visiting Wembley. The party was received on arrival by Mr. J. B. Charters, production manager of the Glass Works, and was entertained to tea at Hirst Hall after the visit. Consumption of gas in manufacturing processes at the works amounts to 750,000 cu ft per day, with a peak load demand of over 35,000 cu ft per hour.

P.O. Engineering Union Conference

Over 350 delegates attended the annual conference of the Post Office Engineering Union which opened on Monday at Blackpool. Mr. E. Power, in his presidential address, complained about the long delays in settling wage claims. He also spoke on the need for loyalty and discipline within the trade unions, and the rôle of the unions in nationalized industry.

Visit to Rugby Works

On Thursday of last week about 150 members of the Midland Branch of the Institution of Mechanical Engineers visited the Rugby works of the British Thomson-Houston Co., Ltd., and toured some of the factories devoted to the manufacture of the heavier plant. The departments visited by the party included those where turbines, gears, tranformers and generators are made, also the new heavy plant building, the fabrication factory and the foundry.

Baby's Fatal Shock in Garden

Through coming into contact with the corrugated iron of a garden shed which had been made "live" by a fault in an electric lead, the two-year-old daughter of a Bournemouth policeman received a fatal shock. At the inquest the father said that five months ago he took a lead from the light in the outdoor lavatory into the shed, over the door. After the accident he found a cut in the cable where it entered, probably caused by the wind blowing the cable against the sharp edge. Mr. D. W. Wheeler, of the Southern Electricity Board, said that there were several "needles" of corrugated iron, one of which had probably penetrated the cable. A verdict of "Death from misadventure" was recorded.

Thames Radio Service

The Postmaster-General announces that as from 1st July a radiotelephone service for messages related to ships' business will be available between telephone subscribers in the London Toll Area and suitably equipped ships on the Thames approximately between Hammersmith Bridge and Southend. The call charge will be 2s 6d for three minutes and 10d for each additional minute, together with the normal inland call charge between the land telephone subscriber and the Dartford (Kent) telephone exchange. Initially, however, the service will be operated from the International Radio Exchange in Lon-

don. Land telephone subscribers wishing to use the service should dial the telephone number MONarch 0221 or ask for "Thames Radio — Monarch 0221." The service, which uses very high radio frequencies with a restricted range, will be the first of its kind to be established in this country. It is hoped that the frequencies used will be standardized on an international basis in order that the ship equipment will be suitable for any other very short-range maritime radio services which may later be established.

Convention Golf

The competition for the G. P. Dennis Golf Trophy, which was played off during the Torquay Convention, resulted in a tie between Mrs. G. N. Green (wife of the chief engineer of the Eastern Electricity Board) and Mr. E. B. Sawyer (manager of the Lighting Service Bureau) who tied with 71 net. Mr. Sawyer gallantly withdrew and left the field to the first lady winner of the trophy. They were followed by Mr. F. Favell (East Midlands Division) and Mr. P. F. Clark (Cable Covers, Ltd.) with 72 net each; and Mr. J. S. A. Bunting (C.M.A.) and Mr. G. N. Green (Eastern Board) with 73. The competition was organized by Mr. G. G. L. Preece.

Water Heating Conference

On 3rd June, at Jury's Hotel, Dublin, a meeting of electrical wholesalers and contractors was held under the auspices of Santon, Ltd., Newport, Mon., and their Irish agents, Van Aalst & Co., Dublin, when a talk was given by Mr. F. C. Robinson, the Birmingham manager of Santon, to over 100 of the leading wholesalers and electrical contractors of the Dublin area on the general application of electricity to domestic electric water heating. Arrangements are being made for a further meeting to be held in the early autumn.

Radio Equipment Orders

An order for twenty-two radio-telephone terminal units has been placed by Cable & Wireless, Ltd., with Marconi's Wireless Telegraph Co., Ltd. These units, which are produced by the Marconi Co. in collaboration with Siemens Brothers & Co., Ltd., have been designed to minimize the special problems of linking radio and land-line transmission; they ensure stability of signal, and provide facilities for controlling the signal level, for discriminating against line and radio noises, and for rendering conversation unintelligible to unauthorized listeners.

The Finnish Broadcasting Co. (O/Y Vlersradio A/B) has ordered one of the new range of broadcasting transmitters designed and manufactured by Marconi's for installation at Helsinki. This is a 100 kW, medium-wave, air-cooled transmitter. The Marconi Co. is also supplying special aerial coupling and tuning units to complete a directional aerial system.

Views on Nationalization

In the report of the Association of Supervising Staffs, Executives and Technicians submitted at the annual conference at Blackpool this week, it was stated that so far the Association had been unable to obtain representation upon the joint negotiating machinery of the electricity supply industry. Commenting on this, the general secretary, Mr. H. G. Knight, referred to the "stupid management policy" of the British Electricity Authorities and said that unless its methods in relation to the lower management grades were changed, nationalization might prove a "dismal failure."

At the Scarborough conference of the National Union of General and Municipal Workers, the chairman, Mr. W. E. Hopkin, said in the course of his address that the Unions involved in the nationalized industries should not press their claims for more favourable conditions too hard. At the same conference there were protests against the appointment of former opponents of nationalization of the gas industry to the gas boards.

Building Licensing

The Minister of Works has made the Control of Building Operations (No. 13), 1949, S.I. 1949 No. 1102 (H.M. Stationery Office, 1d) fixing the amount of building work which may be carried out without a licence during the twelve months 1st July, 1949, to 30th June, 1950.

For ordinary properties, including dwelling houses, a licence will be required for work in excess of £100 in the twelve months. For special classes of buildings (namely, industrial buildings, farm buildings other than dwelling houses, educational buildings, office buildings with a floor area of not less than 10,000 sq ft, and warehouses with a floor area of not less than 5,000 sq ft) the limit will be £1,000. These limits are the same as those in the previous year. Minor amendments have been made in the definitions of the special classes of buildings for the purpose of removing certain anomalies.

Consumer Service in North Scotland

Perth was chosen by the North of Scotland Hydro-Electric Board for two new ventures designed to improve the Board's electricity service to consumers in the

North. The first of these was a five-day "post-graduate" training course for the Board's girl demonstrators. The course was held from 23rd to 28th May.

Dame Caroline Haslett, Director of the E.A.W. and a member of the British Electricity Authority, addressed the girls, and experts from leading electrical appliance manufacturers gave demonstrations. Emphasis was placed during the session on the special domestic electrical problems of housewives in the North.

The other event held in Perth on 26th May was an "electrical evening," the object of which was to get housewives together to discuss their electrical problems with experts. The programme consisted of a cooking demonstration by Miss J. D. Brown, senior demonstrator of the Board, and Mrs. D. Worboys, senior demonstrator of the Jackson Electric Stove Co. A "Brains Trust," whose members included Dame Caroline Haslett and Mrs. A. E. MacColl, president of the Scottish Council of the E.A.W., and wife of the deputy chairman of the Hydro-Electric Board, answered electrical questions.

B.V.C. Exhibition

An exhibition was held last week at the British Vacuum Cleaner & Engineering Company's Goblin Works, Leatherhead, to show the workers, their families, friends and others the many and varied products of the company and its subsidiaries. Products of the parent factory ranged from complete industrial cleaning plants and 65 h.p. exhausters as used in the soot and dust removal plants in power stations, to "Magneta" electric time recorders. "Goblin" domestic vacuum cleaners as made in the company's Surrey and Scottish factories were on view, as well as clocks and the "Goblin Teasmade" set and radio from the Northern Ireland factory. Great interest was shown in the new "Goblin" washing machine.

"Ekco" Window Competition

Following the success of the "Ekco Princess" portable radio set window display last year, E. K. Cole, Ltd., are again running a contest for their dealers, prizes to the value of £250 being offered. The sets to be shown this year are the "Princess" portable again in an extended colour range, and the new "Stroller" mains battery portable. A special prize of £20 is being offered to the assistant responsible for the winning dealer's window.

Defective Permanent-Waving Machine

Giving evidence at an inquest at Blyth on a 29-year-old woman who received a fatal electric shock while having her hair waved, an electrical engineer said that tests revealed leakages in the heating cylinders of the machine which in his opinion rendered it unsafe; under normal working conditions the machine would be dangerous to both the operator and the person being treated. To their verdict of "Accidental death by electrocution" the jury added a rider exonerating the hairdressers and expressing the opinion that such machines should be examined more frequently. On behalf of the National Federation of Hairdressers' Guilds it was stated that newer machines were fitted with transformers to reduce the voltage to 30, making such accidents practically impossible.

Change of Name

Davis Bros. (Illuminating Engineers), Ltd., manufacturers of cable trunking, busbar chambers and lighting equipment, 54, Islington Park Street, London, N.1, have changed their name to the Davis Sheet Metal Engineering Co., Ltd.

Trade Announcements

Edstone, Ltd., have moved to new premises at 88/90, Chandos House, Buckingham Gate, London (telephone: Abbey 4104-6).

The Marine Engineering Co. (Stockport), Ltd., has appointed Mr. P. W. Holland, Holland Park Mansions, Holland Park Gardens, London, W.14, as its London agent.

The sales offices of **Tenaplas, Ltd.,** at Upper Basildon are now complete and the company has left its temporary offices at 78, Buckingham Gate, S.W.1. Inquiries for home sales should be addressed to the company at Upper Basildon, nr. Pangbourne, Berks. Export sales inquiries will be dealt with at the company's head office, 24-25, Manchester Square, London, W.1.

Information Department

THE extensive records of our Information Department enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

"Lyndon" conduit vices.

"Downes" flameproof and weatherproof torches.

"Easi-Strip" wire-stripping tools.

General inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by the Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Electricity Supply

Generation in May : Battersea Smoke Complaint

POWER stations of the British Electricity Authority, North of Scotland Hydro-Electric Board and the Lochaber Power Co. generated 3,850 million kWh in May. This compares with 3,482 million kWh in May, 1948, representing an increase of 10.6 per cent, but account must be taken of the fact that Whitsun fell in May last year. The average rate of increase for the year so far is 6.6 per cent.

	Fuel consumed Thousand tons		kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Oil	Steam	Water Power	Total*		
British Electricity Authority ...	2,276	3.9	3,729	19	3,762	3,541	13,004
North of Scotland	14	0.7	17	69	88	87	322
Total for May, 1949	2,290	4.6	3,746	88	3,850	3,628	13,326
Total for May 1948	2,134	2.8	3,388	85	3,482	3,278	12,947
Per cent increase	+7.3	+64.3	+10.6	+3.5	+10.6	+10.7	+2.9
Total for January—May	12,547	22.6	20,621	577	21,283	20,093	
Corresponding period of 1948 ...	12,085	17.7	19,331	568	19,966	18,846	
Per cent increase	+3.8	+27.7	+6.7	+1.6	+6.6	+6.6	

* Including generation by oil engines, refuse destructors and waste heat plants amounting to 5.8 million, 0.3 million and 9.5 million kWh respectively in May.

In the week ended 10th June 669.3 million kWh was sent out for public supply from solid-fuel fired stations, compared with 796.8 million in the preceding week and 694.2 million in the week ended 11th June, 1948. Coal stocks at electricity undertakings at 11th June aggregated 3,466,000 tons.

Contract for Colliers

Four steam colliers have been ordered by the British Electricity Authority from William Pickersgill & Sons, Ltd., with triple-expansion propelling machinery built by the North Eastern Marine Engineering Co. (1938), Ltd.

West Country Power Stations

Existing generating stations in the B.E.A. South-Western Division have a capacity of 537,800 kW. In a foreword to a well-produced booklet, mainly pictorial, just published, Mr. J. T. H. Legge, the divisional controller, says that plant on order or scheduled for construction will increase this total by 70 per cent, while a further 120 miles of 132 kV main grid transmission lines are in course of erection. A new power station is under construction at Plymouth, another between Bideford and Barnstaple, and a third is projected on the estuary of the River Severn adjacent to the present Portishead station. In close association with the South-Western Electricity Board, the Division looks forward to an era of great advance in the application of electricity throughout the West Country. The photographs include views of the Castle Meads, Portishead "A," Newton Abbot, Hayle and Plymouth "A" stations; site of the proposed 180,000 kW station at East Yelland on the estuary of the Rivers Taw and Torridge; artist's impression of Plymouth "B," also 180,000 kW; Dartmoor catchment area; and a grid line crossing the Rivers Tamar and Tavy, near Plymouth. There is also a contour map of the area.

N. Wales Scheme Opposed

Meeting at Chester last week the River Dee and Clwyd Fishery Board passed a resolution "viewing with grave concern" proposals of the British Electricity Authority for hydro-electric schemes in the Fishery Board's area, and strenuously opposing the abstraction of water which should enter the Dee system. Mr. Duncan Robertson, presiding, said that there would be an additional flow down the Conway, while the Dee would lose water. There were increasing demands from towns, villages and works for water from the Dee and their interests must be protected.

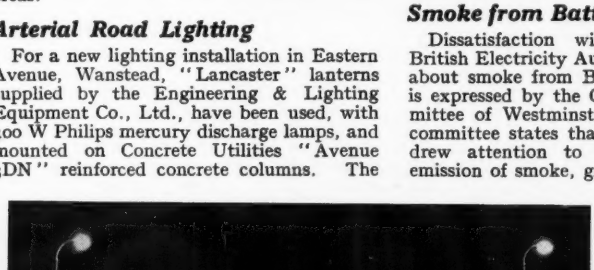
Overseas Engineers' Visit

Engineers from Belgium, Finland, France, Greece, Portugal, Spain and Sweden recently took part in a tour of hydro-electric projects in the Highlands arranged by the British Council in co-operation with the

North of Scotland Hydro-Electric Board. Visits were paid to Pitlochry, Tummel-Garry, Glen Affric, Glen Fannich, Kyle of Lochalsh, Kinlochleven and Loch Sloy as well as the works of Bruce Peebles & Co., Harland Engineering Co., Harland and Wolff, and Glenfield and Kennedy. M. Melignon, who is concerned with hydro-electric development in the Belgian Congo, at the conclusion of the tour last week, said he was impressed by the way the Board was providing for the distribution of electricity to scattered populations in non-industrial areas.

Arterial Road Lighting

For a new lighting installation in Eastern Avenue, Wanstead, "Lancaster" lanterns supplied by the Engineering & Lighting Equipment Co., Ltd., have been used, with 400 W Philips mercury discharge lamps, and mounted on Concrete Utilities "Avenue 3DN" reinforced concrete columns. The



New lighting installation at Eastern Avenue, Wanstead

installation, comprising 76 points, was planned by the borough surveyor of Wanstead and Woodford, the Engineering & Lighting Equipment Co. being responsible for the supply of all the material required and also for the erection work. Subject to Ministry of Transport approval a further 282 points will shortly be installed. The "Lancaster" lantern is of the controlled cut-off type, light distribution being effected by a combination of anodized aluminium reflectors and a bottom single-piece dish refractor. A magnetic deflector device is carried in the body of the fitting.

Fluorescent Lighting in Ulster

What is believed to be the first fluorescent street lighting scheme in Northern Ireland has been approved by the Lisburn Urban Council. The estimated cost is £27,125. Previously it had been decided to have mercury lighting, and the new scheme will cost an extra £9,892.

Liverpool Conversion

Alderman A. Critchley, who was re-elected chairman of Liverpool Corporation Lighting Committee last week, stated that in order materially to increase the rate of re-lighting, it would be advisable to consider large-scale conversion schemes from gas to electricity.

Smoke from Battersea

Dissatisfaction with a reply by the British Electricity Authority to a complaint about smoke from Battersea power station is expressed by the General Purposes Committee of Westminster City Council. The committee states that in April the Council drew attention to the continued heavy emission of smoke, grit and fumes from the power station and expressed to the B.E.A. concern at the delay in installing gas - washing equipment. In a letter dated 16th May the Authority stated that the reconditioning of the north-west chimney tower and installing new scrubbers and spray pipework should be completed and ready for the restoration of gas washing by the end of August, but that the reconditioning of the remaining tower would, having regard to the present labour and steel position, require two years, and would not be completed before the spring of 1951. The committee declared that it considered the reply was most unsatisfactory and recommended that the B.E.A. should be asked to give an assurance that it would take steps to ensure that the whole of the gas-washing installation would be completed by the spring of 1950.

Yorkshire Rural Supplies

Mr. G. B. Drayson, M.P. for Skipton, has been informed by the Yorkshire Electricity Board that it anticipates that Cracoe will be supplied with electricity in the first year of the Board's rural development plan, i.e., by 31st March, 1950, and it is hoped that Hetton and Rylstone will get a supply by 31st March, 1951.

Reports and Dividends

British Electric Traction Co., Ltd.—For the year ended 31st March the aggregate net profit of the company and subsidiary companies, after charging debenture interest and taxation, is £1,177,989, of which £991,375 is attributable to the parent company. Deducting the balance of profits retained by subsidiaries, the net profit of the parent company is £704,101 (which compares with £574,588 for the previous year). The net profit of the parent company includes £73,895 additional net revenue resulting from a change in the financial year-end of a subsidiary, and is arrived at after providing £570,000 for taxation (£472,000). The directors recommend the following final dividends: participating preference stock, 5 per cent (8 per cent for the year); preferred ordinary stock, 4 per cent, making 8 per cent; deferred ordinary stock, 35 per cent, making 50 per cent (same). There remains £396,928 (£267,415) to be transferred to undivided profits account.

Ruston & Hornsby, Ltd., report a net profit (including £151,140 from trade and other investments) of £717,178 (£480,654 last year), after deducting depreciation £107,810, debenture interest £15,750, and taxation £656,258. It is proposed to appropriate £150,000 to plant replacement reserve, £100,000 to pensions reserve, £200,000 to general reserve, £190,000 to stock and general contingencies reserve, and to pay 12½ per cent less tax on the ordinary stock. These appropriations, after bringing in £121,045 sundry provisions no longer required, leave a balance to be carried forward of £184,665 (£140,304 last year). The combined net profit of the company and its subsidiary companies, together with income from trade and other investments, amounts to £976,643 (£543,069 last year), after deducting depreciation £168,081, debenture and other interest £23,878 and taxation £1,044,117.

The British Thermostat Co., Ltd.—The annual meeting was held on 11th June. In his statement circulated with the report and accounts, Col. N. Hudson (chairman) says that the company started the year with a false forward order position, due to over-ordering by some customers and resultant cancellations. The flexibility of their organization, however, enabled them to cope with this situation. As they sell mainly to manufacturers it is difficult for them to estimate their exact contribution to the export drive, but their direct exports show a steady improvement. Owing to the difficulties of obtaining import licences and lack of sterling, it may be necessary for them to undertake manufacture or at least a part manufacture of their products abroad. Their subsidiary, Teddington Controls, Ltd., has completed its first full trading year in the new factory in South Wales, and the results are gratifying.

Referring to the future, the chairman says that competition will be keener and business will be harder to get both at home and abroad, and some of their bigger customers, in view of their increased turnover, may be encouraged to make their own control apparatus. This has been anticipated by the company and they believe that the introduction of new products and their effort to reduce the cost of manufacture will stand them in good stead.

Automatic Telephone & Electric Co., Ltd.—There is every reason to believe that 1949 will see progressive expansion of the company's business, since the value of orders in hand shows no appreciable reduction. Announcing this in his annual report, Sir Alexander Roger, the chairman, says, however, that for some time the balance of working capital must continue to be provided by bank overdraft, as with crippling taxation it is virtually impossible to plough back sufficient money into the business. Later it may be considered desirable to finance part of this temporary borrowing by long-term loan arrangements. The consolidated group profits before taxation amounted in 1948 to £818,959, compared with £636,261 in 1947, and the net profit, after taxation, was £356,117 (£162,610).

Enfield Cables, Ltd., proposes to increase its capital to £2,000,000 by the creation of 500,000 4½ per cent £1 second preference shares and 300,000 £1 shares with no specified designation. Application has been made to the Treasury for permission to issue the second preference and the 200,000 existing unissued ordinary shares. The second preference will be offered to all members of the company, and the ordinary will be a "rights" issue to holders of the ordinary stock.

The British Vacuum Cleaner & Engg. Co., Ltd., reports a trading profit for the year ended 30th September last amounting to £107,414 (£106,757), plus other income £534 (£14,607), making £107,948 (£121,364). Depreciation absorbed £25,389 (£20,000), bank interest £16,171 (£13,475), directors' fees £1,450 (same), directors' management remuneration £12,328 (same),

annuity to director £500 (same), taxation £28,000 (£36,109) and staff pension fund nil (£5,000). An ordinary dividend of 20 per cent is again paid and £29,369 (£26,297) is carried forward.

The Anglo-Argentine Tramways Co., Ltd.—The initial consolidated accounts for 1948 record a loss of £195,475. This brings the debit balance to £407,165, less £119 profits on sales of property. The question of adequate compensation for the British interests concerned is being pursued and it is apparent that the Argentine Government is now willing to enter into direct negotiations with the company.

The International Combustion Co., Ltd., is to maintain its interim ordinary dividend at 10 per cent. Application is to be made to the C.I.C. for permission to capitalize reserves in order to issue three bonus shares for every two 5s ordinary shares.

New Companies

Estreich Electrical Co., Ltd.—Registered 7th May. Capital £1,000. Manufacturers of and dealers in electrical and other equipment, etc. I. Estreich is the first director. Regd. office: Steyne House, 89, Hervey Close, N.3.

Smith & Croft, Ltd.—Registered 21st May. Capital £5,000. Electrical engineers and contractors, etc. Directors: A. Smith and Mrs. M. Smith. Regd. office: 32, North Parade, Bradford.

L. M. Partington & Co., Ltd.—Registered 28th April. Capital £1,000. Designers and manufacturers of and dealers in radio, television, telephone and electrical apparatus, etc. Directors: A. Gunn, J. A. Gunn and Lucy M. Gunn. Regd. office: 57a, Water Lane, Wilmslow, Ches.

North Cambrian Electrical Engineering Co., Ltd.—Registered 31st May. Capital £2,000. Directors: E. G. F. Davey and J. H. Barber. Secy.: J. H. Barber. Regd. office: Chemistry Lane, Queens Ferry, Nr. Chester.

Electrical Maintenance & Service Co., Ltd.—Registered 31st May. Capital £3,000. To acquire the business of an electrical and mechanical engineer, now carried on by Albert S. Fraser at 1 and 3, Shrewsbury Road, Forest Gate, E.7, as "Electrical Maintenance & Service Co." Directors: A. S. Fraser and W. E. Halford. Secy.: Charles E. Clarke. Regd. office: 1-3, Shrewsbury Road, Forest Gate, E.7.

Fraser Speller Engineering Co., Ltd.—Registered 31st May. Capital £2,000. Manufacturers, repairers and dealers in dynamos, motors, armatures and magnetos; sign makers, etc. Subscribers: S. S. W. Mackrell and J. W. Wallis. Regd. office: 43, Stonecot Hill, North Cheam, Surrey.

Laurence Industrial Instrument & Control Co., Ltd. — Registered 31st May. Capital £2,000. Electrical experts and electrical contractors. R. F. Laurence is first director. Secy.: James Stark. Regd. office: 18, Hanover Street, W.1.

Univalve Auto Alarms & Electrical Co., Ltd.—Registered 3rd June. Capital £2,000. Manufacturers and repairers of and dealers in burglar alarms, safes, strong rooms, electrical and clockwork signalling and timing equipment, etc. Directors: F. W. Sloggett, L. H. Sloggett, F. L. Mills and F. J. Becker. Regd. office: 38, Chipstone Street, W.1.

Land, Air & Sea Instruments Co., Ltd.—Registered 13th June. Capital £1,000. Manufacturers and servicers of and dealers in instruments and apparatus, and component parts, used for radio or electronic communications or transmissions, etc. Solrs.: Routh Stacey Hancock & Willis, 14, Southampton Place, W.C.1.

Frank Ellis & Co. (Electrical), Ltd.—Registered 11th June. Capital £1,000. To acquire the business of electrical contractors carried on at 51, Friston Street, Ladywood, Birmingham, as Frank Ellis & Co. Permanent directors: F. Ellis, H. R. Ison and J. F. Williams. Secy.: F. Ellis. Regd. office: 51, Friston Street, Ladywood, Birmingham.

Company Struck Off the Register

The name of Byfleet Electric, Ltd., was struck off the Register on 17th June and was thereby dissolved.

Winding-up Petition

Refrigeration Consultants, Ltd.—A petition for the winding-up of the company is to be heard at the Royal Courts of Justice, Strand, London, W.C.2, on 4th July. Any person who intends to appear must notify Judge, Hackman & Judge, solicitors, 17, Manchester Sq., London, W.1, by 2nd July.

Liquidations

British Diamix, Ltd.—Winding up voluntarily. Joint liquidators: Mr. W. English, 211, Lower Addiscombe Road, Croydon, and Mr. P. J. Snow, 17, Albion Street, Hanley, Stoke-on-Trent.

Modern Neon Sign Publicity, Ltd.—Winding up voluntarily. Liquidator. Mr. H. F. E. Mathews, 61, Commercial Road, Portsmouth.

Braddon Electrical Co., Ltd.—Meeting, Greenland Mills, Bradford-on-Avon, Wilts, 12th August, to receive an account of the

winding-up by the liquidator, Mr. R. H. Nailer.

The A. L. Parker Co., Ltd.—Creditors' voluntary winding-up. Liquidators, Mr. R. A. Rodgers, 25, Bedford Row, London, W.C.1, and Mr. C. A. Sparkes, 29-31, Euston Road, London, N.W.1, appointed 7th June.

Electronics (Ramsgate), Ltd.—Members' voluntary winding-up. Liquidators, Lyndon S. Rees & Co., 23, Stanley Road, Ramsgate, appointed 11th May.

Vacuum Refrigeration, Ltd.—Meetings, 49, Moorgate, London, E.C.2, 21st July, to receive an account of the winding-up by the liquidators, Messrs. R. H. A. Neuschild and A. Shelley.

Hume Electric, Ltd., 620, Finchley Road, London, N.W.11.—Proofs for dividends by 18th July to the liquidator, Mr. D. Morgan, 19, St. Martin's Street, London, W.C.2.

Williams Brothers (Luton), Ltd.—Members' voluntary winding-up. Liquidator, Mr. T. R. Keens, 11, George Street West, Luton, appointed 31st May.

Bankruptcies

P. L. A. Eliot, carrying on business at 103, Denton Street, Carlisle, electrician and radio dealer.—First meeting held 22nd June. Public examination 30th June at the County Court offices, 39, Lowther Street, Carlisle.

G. E. Palmer, 2A, Hollybush Terrace, Westow Street, Upper Norwood, London, S.E.19, electrical equipment manufacturer, formerly of 2, Hollybush Terrace, Westow Street, Upper Norwood, S.E.19.—First meeting held 23rd June. Public examination 25th August at the County Court, Scarbrook Road, Croydon.

G. L. Barber, electrical contractor and radio engineer, 19, St. Alban's Street, Weymouth.—Receiving order made 14th June on debtor's own petition.

J. S. Hibbert, electrician, lately carrying on business at 39, Ashton Road, Oldham, and now at 47, Parliament Street, Morecambe.—Receiving order made 13th June on a creditor's petition.

L. M. Watts, radio and electrical engineer, Cucumber Lane, Brundall, Norfolk.—First meeting 28th June at the Official Receiver's office, Castle Chambers, Opie Street, Norwich. Public examination 25th July at the Shirehall, Norwich.

R. S. Warrell, electrician, trading as R. S. Warrell & Son, 2, Norfolk Road, Littlehampton.—Trustee, Mr. A. E. Orbell, 6 and 7, Old Steine, Brighton, appointed 13th June.

F. A. Tarbox, trading as "Tudor Electrical Services," electrical engineers, Station Yard, Mill Hill, Middlesex.—Trustee, Mr. N. G. Randall, 19-20, Grosvenor Place, London, S.W.1, released 17th May.

J. W. Johnson, electrician, lately carrying on business at Newbridge Hill, Louth.—Trustee, Mr. H. S. Bloomer, 8, Flottergate, Great Grimsby, released 14th June.

R. H. Ball, formerly carrying on business at Gordon Street, Leamington Spa, as a radio and electrical manufacturer.—Proofs for dividends by 2nd July to the trustee, Mr. R. K. Clark, 37, Temple Street, Birmingham, 2, Official Receiver.

Trade Marks

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within a month from 15th June:—

C.A. (design). No. B670,263, Class 7. Electric current generators and parts included in Class 7.—Clifton Aircraft, Ltd., Arcadia Works, Victoria Street, Lytham, Lancs.

MISTMASTER. No. B670,925, Class 7. Electrically operated sprayers and atomizers.—Jeyes' Sanitary Compounds Co., Ltd., Richmond Street, Plaistow, London, E.13.

SUPREX. No. B670,072, Class 9. Measuring and recording instruments.—Brian R. Morris & Co., Ltd., 24, Victoria Street, St. Albans.

RHEO. No. 670,776, Class 9. Electrical apparatus and instruments included in Class 9, radio receiving sets (complete) and parts included in Class 9, and measuring instruments.—"Velba" Vertriebsgesellschaft für Electrotechnische Bedarfsartikel m.b.H, Vienna. Address for service: c/o Mewburn, Ellis & Co., 70-72, Chancery Lane, London, W.C.2

VERTEND. No. 671,683, Class 9. Electric welding electrodes.—Rockweld, Ltd., Commerce Way, Croydon.

ENALAM. No. 673,141, Class 9. Electrical apparatus and instruments included in Class 9; scientific apparatus and instruments and wireless sets (complete); and parts included in Class 9.—Engineering & Allied Manufacturing Co., Ltd., 12, Westbourne Street, Lancaster Gate, London, W.2.

BELFRO. No. 671,428, Class 11. Electric lamps for vehicles.—Bell & Frome, Ltd., trading also as Belco Products, 23, South Road, Burnt Oak, Edgware.

ELECTRO-MATIC. No. 672,065, Class 11. Water-softening apparatus having electrically controlled means for regeneration, and parts included in Class 11.—Permutit Co., Ltd., Gunnersbury Avenue, London, W.4.

BLIZZARD. No. 672,546, Class 11. Refrigerators for cold rooms and for cold storage installations, and evaporators (being parts of refrigerators).—F. V. Atkinson and J. Fulton, trading as Atkinson Eng. Co., 282, High Road, Willesden, London, N.W.10.

AQUONLY. No. 673,685, Class 11. Milk cooling installations and parts thereof included in Class 11.—Refrigeration (Bletchley), Ltd., 70, High Street, Fenny Stratford, near Bletchley.

OMEGA. No. 670,438, Class 17. Electric insulating tape.—General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

STOCKS and SHARES

HEAVY falls in the Stock Exchange market for gilt-edged securities make the outstanding feature of the past few business days. On Monday in this week, a stream of very persistent selling broke out in Consols, British Transport, British Electricity and other Government stocks, with the result that prices were forced down in a manner which spread sympathetic heaviness round most of the markets, which no immediate Government support was forthcoming to combat.

Above the Worst

One direct consequence of the fall was to dry up the springs of enterprise as translated into purchases of stocks and shares after a heavy fall, which, according to Stock Exchange tradition, should be succeeded by upward reaction. The latter, however, has yet to occur in any material way, though prices are in some cases slightly above the lowest recently reached. Since a week ago, further falls have occurred, but the pressure to sell, so far as can be ascertained from personal observation in the industrial markets, is less pronounced than it was two or three weeks back.

Highs and Lows

Electrical equipment shares have followed with a good show of reluctance in the rear of the industrial market's retreat, and the following dozen representatives show that several have beaten the average experience over the past 2½ years:—

Company	1947/9 Prices Highest	Lowest	Present Price
A.E.I.	94/3	63/9	71/6
Automatic Telephone...	83/–	50/–	66/9
B.I.C.	52/3	30/–	30/–
Brush	9/9	5/–	5/3
E. K. Cole	34/3	11/–	11/6
Cossor	37/6	5/6	5/6
Crompton Parkinson ...	35/3	23/–	23/9
E.M.I.	29/6	14/9	15/3
G E.C.	103/9	79/6	81/6
J. Lucas	91/9	60/–	73/9
Siemens	41/3	29/–	32/6
Telegraph Construction	62/3	40/–	47/–

Enfield Cables Capital

News of Enfield Cables' proposed capital issues provoked the now familiar market reaction to such occasions. The ordinary shares were marked back 1/8 to 32s 6d, in anticipation of the temporarily depressing influence of a "rights" issue—the form in which it is intended to offer 200,000 new ordinary shares to present holders. All stockholders will, it is proposed, be offered participation in the half-million 4½ per cent second preference shares. The present issued capital of the company is £1 million, including £200,000 in 7½ per cent preference shares quoted at 37s 6d, on a yield basis of 4 per cent. The ordinary at 32s 6d give £4 12s 3d per cent on the 7½ per cent paid for 1948.

General Cable Bonus

Few bargains have been recorded lately in General Cable Manufacturing 5s ordinary shares, and there has been no change in the official quotation of 32s 6d since the company's proposal to issue a capital bonus of two new shares for every three held. The intention envisages a straight-forward capitalization of half the general reserve of £100,000 which would raise the present ordinary capital from £75,000 (an equal amount of preference capital is in issue) to £125,000—a figure more in keeping with the money employed in the business. Dividends for 1947/8 totalled 50 per cent—about half the available rate of earnings. The controlling interest is held by F. McNeill & Co., and a few hundred shares are on offer at 33s 9d to yield £7 8s 3d per cent at that price.

Five per cent Upwards

Investors are being offered an increasingly wide choice of good industrials giving them 5 per cent, or more, on their money from well-covered dividends. Crabtree Electrical Industries 10s ordinary at 34s are a case in point, having fallen this year from 43s and now returning £5 3s 0d per cent from the dividend of 17½ per cent paid last time from group earnings of about 40 per cent. On Hackbridge & Hewittic 5s shares at 12s the yield is a round 5 per cent from the 12 per cent dividend, covered by earnings of 20 per cent. Revo Electric's last 27½ per cent distribution came from earnings of well over 100 per cent; at 52s 6d the shares pay £5 2s 9d per cent. Scottish Cables at 24s 3d now give 5 per cent, and Aberdare Cables at 53s 3d, £5 12s 9d per cent.

Cheaper Preference Shares

Enfield Cables' issue announcement coincided with rumours of a 4 per cent preference issue on a very large scale by the Imperial Tobacco Company. After long displaying indifference to surrounding influences, preference shares as a class have become noticeably cheaper during the past week, particularly in the case of shares with which the expected newcomers might come into competition. Of the popular 4 per cent issues in the electrical engineering section, those of C. A. Parsons, Automatic Telephone and Reyrolle are all quoted now around 21s 3d, at which they return just over 3¾ per cent. English Electric's 3½ per cent stock stands at par. G.E.C. 7½ per cent at 38s 6d pay £3 18s 0d per cent, and A.E.I. "eights," at 40s, a round 4 per cent.

CONTRACT INFORMATION

ACCEPTED TENDERS AND PROSPECTIVE ELECTRICAL WORK

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—MELBOURNE.—31st August. Victorian Government Railways. Twelve, or alternatively thirty-two, 1,500 kW rectifier units. (C.R.E. (I.B.) 12725/49. Ten/417.)*

Dundee.—15th August. North of Scotland Hydro-Electric Board. Two 10,000 kVA transformers. (See this issue.)

Durham.—4th July. County Council. Electrical installation at Crook County School. County architect, Court Lane, Durham.

Egypt.—CAIRO.—2nd August. Electricity and Gas Administration. Supply of thirty transformers. (17th June.)

India.—MADRAS.—The closing date for the submission of tenders for substation equipment and transformers for certain extensions of the Madras grid has been further postponed to 11th July. (C.R.E. (I.B.) 363/49. Ten/147C.)*

Littlehampton.—29th June. Urban District Council. Electrical installations in eight maisonnettes at Hill Road site. Surveyor, Urban Council Offices.

Morecambe and Heysham.—6th July. Corporation. Electrical installations at Blackberry Hall housing estate. (17th June.)

New Zealand.—WELLINGTON.—6th September. State Hydro-Electric Department. 66 kV potential transformers. (C.R.E. (I.B.) 15128/49. Ten/430.)*

13th July. Stores Division, General Post Office. 29,000 switchboard lamps. (C.R.E. (I.B.) 16609/49. Ten/447.)*

North of Scotland.—22nd July. Hydro-Electric Board. Lighting, heating and auxiliary cabling installation at the power station and dam, Loch Striven, Argyllshire. (See this issue).

Reading.—5th August. Corporation. Electrically driven automatically controlled pumping plant for Southcote. Howard Humphreys & Sons, 34, King's Road.

Seaton Valley.—U.D.C. Electrical installation in 18 old people's houses at Shiremoor. Plans by the surveyor, Council Offices, Seaton Delaval.

South Africa.—DURBAN.—19th August. Electricity Department. Watt-hour meters. (C.R.E. (I.B.) 16181/49. Ten/444.)*

Thailand.—BANGKOK.—7th November. Department of Public and Municipal Works. Boilers and turbo-alternator sets for Samsen power station. (C.R.E. (I.B.) 16059/49. Ten/441.)*

West Riding.—4th July. County Council. Electrical installation in connection with adaptations at the Divisional Health Office, Summer Lane, Wombwell. County architect, County Hall, Wakefield.

* Specifications may be inspected at the Commercial Relations and Exports Department, Thames House North, Millbank, S.W.1.

Orders Placed

Hatfield.—Herts County Council. Installation of electrical services at Technical College (£35,270).—T. Clarke & Co., Ltd.

London.—L.C.C. Electrical installations in schools:—Peckham Rye School, Mead & Jeffery, Barlby Road School, Tucker Installations. Purrett Road School, Reliance Electrical Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Albrighton.—County primary school; A. G. Chant, county architect, 5, Belmont, Shrewsbury.

Alnwick.—Houses (50) and three-storey block of flats for U.D.C.; Reavell & Cahill, architects, Lloyds Bank Chambers.

Atherstone.—Houses (55), in four sections, for R.D.C.; H. N. Jepson, Midland Bank Chambers, Nuneaton.

Batley.—Conversion of Highfield House, Toothill Lane, into hostel for the blind; Firth, Son & Blackburn, architects, Broadway House, Dewsbury.

Birmingham.—Two-storey civic restaurant (£31,736), Frederick Street site; city engineer, The Council House.

Bolsover.—Houses (44), Moor Lane Scheme No. 4; J. Aspinall, clerk to U.D.C., Urban Council Offices.

Bolton.—Extensions to mill for F. S. Shorrock, Oakenbottom Mill, Bury Road; Thos. E. Smith & Son, architects, Central Chambers, Folds Street.

Bournemouth.—Six blocks of flats, Kinson estate, for T.C.; borough architect.

Bradford.—Extensions to Technical College; city architect.

Bridgwater.—Factory, Dunball; A. H. Marks & Co., Ltd., Wyke Lane, Wyke, Bradford.

Bridlington.—Houses (49), Bessingby estate; borough engineer.

Brierley Hill.—New civic restaurant, The Elms, High Street; Jennings, Homer & Lynch, architects to U.D.C., 5, Church Street.

Houses (50); J. R. Moore, Moore Street.

Burnley.—Ophthalmic operating suite at Victoria Hospital, Hitchen, Pickup & Halsted, architects. Manchester Road.

Castle Ward.—Houses (100) for the R.D.C.; J. Bolton, surveyor, North Road, Ponteland.

Cheltenham.—Flats (48), Lynworth Farm estate; borough engineer.

Research premises; Dowty Equipment, Ltd., Arle Court.

Chigwell.—Flats (24), Valley Hill, Loughton, for U.D.C.; Tooley & Foster, architects, Midland Bank Chambers, Buckhurst Hill.

Coventry.—Development of Tile Hill neighbourhood unit, comprising 323 houses, 130 flats, etc.; E. H. Ford, city engineer, 1a, Warwick Row.

Chelmsford.—Houses (300), Chignal estate; borough engineer.

Crook (Co. Durham).—Factory additions for Marshall Richards Machine Co., Ltd.; William Moss & Son, builders, St. Mary's Place, Newcastle-on-Tyne.

Cumberland.—Nine school canteens (£15,000), fire stations at Wigton and Cockermouth and 13 firemen's houses at Workington, and conversion of Glenhill, Wigton, into residential nursery and children's homes for the C.C.; county architect, Portland Square, Carlisle.

Douglas (Isle of Man).—Houses (134), Willaston estate; borough engineer.

Glasgow.—Factory; David Rattray & Co., Ltd., 11, Murray Street.

Isle of Wight.—Police and fire stations, Shanklin Buildings, for C.C.; F. H. Booth, county architect, Newport.

Leicester.—Houses (229) and four shops, New Parks estate; city architect.

Liverpool.—R.C. infants' school, Speke; Morrison & Sons, Ltd., Grange Terrace, Liverpool, 15.

Lleyn.—Houses (10), Abersoch; S. Owen, Penrhos.

London.—BROCKLEY.—Block of flats, Brakspear Road, for Deptford B.C.; H. V. Ashley & Winton Newman, architects, 3, Verulam Buildings, Gray's Inn, W.C.1.

CLAPHAM.—Flats (24), Lessar Avenue, for Wandsworth B.C.; borough architect.

WESTMINSTER.—Warehouse premises, 1/15, Rochester Row; Gee, Walker & Slater, Ltd., builders, 100, Park Lane, W.1.

CAMBERWELL.—Development of Hardcastle Street area for 132 dwellings, lifts, laundries, etc. (£274,300); director of housing, L.C.C., County Hall, Westminster Bridge, S.E.1.

Manchester.—County primary school, Devonshire Street, Ardwick; P. B. Dingle, town clerk, Town Hall, 2.

Houses (15), Shawdene Road and Woodburn Road, Northenden; H. Hankinson, architect, 3, The Downs, Altrincham.

Extensions to rubber works for Frankenstein & Sons (Manchester), Ltd.; Cruickshank & Seward, architects, 16, Princess Street, Manchester.

Newcastle-on-Tyne.—Blocks of ten-storey flats to accommodate 4,000 families (£10,000,000); G. Kenyon, city architect, 18, Cloth Market, Newcastle.

X-ray department at the General Hospital for the Newcastle Hospital Board; G. Kenyon, architect, 18, Cloth Market, Newcastle.

Four temporary stores, Russell Terrace, for Kay Kitchencraft, Ltd.; M. Gatoff, architect, Trafalgar Street.

Pathological laboratory and blood transfusion centre at the General Hospital for Newcastle Hospital Board (£180,000); P. H. Knighton, Board's planning architect, Osborne Road, Newcastle.

Improvements costing £2,600,000 for miners, including pithead baths at 50 collieries, 23 canteens, and 20 medical health centres, for the Northern Coal Board Division, Newcastle.

Erection of 18 houses in flats, Gillies Street; R. A. Gofton & Sons, builders, Monkseaton.

Newport (I.o.W.).—Omnibus station; borough engineer.

Newton Abbot.—Houses (46), Buckland estate; U.D.C. surveyor.

Norham and Islandshires.—Bungalows (22), Cornhill; R.D.C. surveyor.

Northallerton.—Houses (16), Valley Road site; W. Thompson, North End, Northallerton.

North Riding.—Fire station buildings and alterations to existing buildings (£86,000) and also 64 firemen's houses; county architect, Northallerton.

Junior and infants' school on Barrowcliffe estate, Scarborough (£78,000); Jaram & Son, builders, Scarborough.

Northumberland.—Canteen kitchen at Longbenton Hazlerigg R.C. School for the C.C.; Applebys, Ltd., builders, Newcastle-on-Tyne.

Prefabricated kitchen and dining room at the Whitley North County Primary School (£10,000); H. D. Harding, Ltd., builders, Wellington Road, Gateshead.

Houses (20) at Kielder for the Forestry Commission, York; Mauchlen & Weightman, architects, 12, Saville Row, Newcastle-on-Tyne.

Nottingham.—Pithead baths, etc. (£59,686), at Langton Nos. 7 and 8 Collieries; W. J. Simms, Sons & Cooke, Ltd., builders, Hadyn Road, Sherwood.

Extensions to University; T. C. Howitt, architect. St. Andrew's House, Mansfield Road.

Otley.—Houses (32), Weston Lane; Harrison (Builders), Ltd.

Plymouth.—Works and offices, Stuart Road; Reeds' (Plymouth). Ltd., 75/76, Coburg Street.

Rawmarsh.—Houses (70), Monkwood estate; J. R. S. Crighton, U.D.C. surveyor, Council Offices, Parkgate, Yorks, W.R.

Reading.—Warehouse, etc., Vachel Road; W. H. Smith & Son, Ltd., Strand House, Portugal Street, W.C.2.

Dwellings (78), Westwood Road estate; Francis Bros. (Builders), Ltd., Tilehurst.

Rugby.—Houses (40) on two sites; surveyor to R.D.C., 24, Warwick Street.

Runcorn.—Houses (44), Russell Road estate; Salisbury & Peel, Ltd., Llandudno.

Salford.—Houses (40), Fairhope estate; Lanes Construction Co., Ltd., Swinton, near Manchester.

South Shields.—Houses (36); William Leech, Ltd., builders, Clayton Street, Newcastle-on-Tyne.

Children's homes at Simonside; borough engineer.

Stamford.—Cultural centre and civic theatre; N. H. Cooper, borough surveyor, Municipal Offices.

Stockton-on-Tees.—Dairy, Church Road, for the C.W.S., Ltd. (£60,000); C. W. S. Building Dept., West Blandford Street, Newcastle-on-Tyne.

Sunderland.—Adaptation of West Hendon House as a hostel for old people; borough engineer, 27, Fawcett Street.

Additions to the Royal Infirmary (£100,000) for the Newcastle Hospital Board, Osborne Road, Newcastle-on-Tyne.

Health centre, Springwell Road; borough engineer, 27, Fawcett Street.

Swindon.—School (£134,000); F. I. Bowden, county architect, County Hall, Trowbridge, Wilts.

Weetslade (Northumberland).—Pithead baths (£56,000); G. Wimpey & Co., Ltd., builders, Newcastle-on-Tyne.

York.—Extensions to factory; Bell Buttons, Ltd., North Street.

Britain's Export Organization

FULL REALIZATION OF CUSTOMERS' NEEDS

By LESLIE GAMAGE, M.C., M.A.

FOR many years to come Britain will be called upon to exert herself as no exporting community has yet had to exert itself. Our dwindling exports in the period between the two world wars, coupled with the take-it-or-leave-it attitude of some of our manufacturers, raised doubts in many quarters as to whether Britain could pull herself together and do the job. I think the answer is now being given. Britain is showing her powers of recovery in a manner which is wringing praise from some of her former strongest critics and the prestige of sterling is once more firmly established. Nevertheless, she has still a long way to go and I fear there are still many people who have not yet understood sufficiently the magnitude of the export effort we have still to put forward, not only to make good our losses incurred during the war, but also to re-establish this country as the leading nation in the world, as we intend it shall be.

Mr. Gamage is vice-chairman and joint managing director of the General Electric Co., Ltd., of England ; president of the Institute of Export ; and chairman of BETRO

Britain is, of course, no newcomer to the export game : she has played it for many years with conspicuous success. The electrical industry is a good example. In 1900 Britain was an importer of electrical machinery and products, but by 1938 she had become the world's largest exporter of electrical equipment, surpassing both Germany and the United States of America in this respect.

The fact is that the whole of Britain's economic structure has been built upon the foundation of export and, although in the beginning it was easy, compared with the difficulties encountered to-day, to export manufactured articles to a world mostly incapable of producing them, the fact remains that Britain has more of the " know how " of export than the rest of the world put together. What we have to watch is that this knowledge is kept abreast of the times and that the British manufacturer develops and uses the latest export technique just as the British jet aircraft designer has developed and used the most advanced propulsion techniques.

The overseas buyer expects an up-to-date export technique as part of the service we give him. He expects, and has the right to expect, that not only will our products be as good in quality as we say they are and that they will have the right kind of appearance and sell at the right price, but also that they will be packed properly and protected against any particular climate ; that they will be despatched with speed and safely delivered to him with the minimum of trouble ; that they will be accompanied by full instructions in his own language on how to assemble and how to use ; that they will be given the right kind of adverti ing appropriate to his country ; that spare parts will be readily available ; and that, for technical equipment at least, an adequate maintenance and advisory service will be there to help him in an emergency.

There has been a lot of this technique in the past ; but not all of it. We had been inclined rather to neglect the more abstract aspects of the technique—the appearance of the product, the appeal of its packing, the kind of advertising it was given and whether, indeed, a particular country really liked the product at all. These aspects, among many others, have been given much consideration in Britain during the past few years and I am glad to say that the plans laid to instil into the nation a better appreciation of the vital importance of these aspects of

Britain's Export Organization—*continued*

export technique are now bearing fruit.

With increasing competition for world markets among the industrial nations, Britain is "streamlining" her export technique by providing her manufacturers with facilities for obtaining scientifically prepared market research reports on countries considered as possible markets, for obtaining expert advice on improving the appearance of their product and, if necessary, its packing, and for the scientific training of their administrative staffs in all aspects of export.

The British Council of Industrial Design, of which I am a member, is doing extremely good work in fostering among manufacturers the idea of adding good appearance to all the other qualities of their products. Good appearance is not obtained by trying to add it as an afterthought—it must be injected into the product in the early design stages.

Customers' Ideas Must Prevail

Further, the manufacturer must design his products with his customer's ideas of good appearance (which may not necessarily be his own) and with his customers' particular likes and dislikes in mind. Such market research, requiring the services of highly skilled staff, would not ordinarily be available to any but the largest manufacturers. For this reason, the British Export Trade Research Organization (known as BETRO) was created to provide a comprehensive service of detailed research and intelligence on markets for British products throughout the world. This organization specializes in consumer and dealer research, using the most modern scientific methods, but it also carries out preliminary market enquiries of a more general character. The organization is non-profit-making and its services are open to all British manufacturers.

I know that BETRO is providing a most valuable service, not only to the British manufacturer, but also to the overseas customer who, as a result of the information and advice provided in the pre-manufacturing stage, is assured of a product which will give him satisfaction.

Then there are the subjects of sales policies and distribution with their many complexities, all of which must be an open book to the British manufacturer who desires to deliver his exports speedily and safely into the hands of his customer. The administrative side of export has long since passed the days when a clerk with a timetable of ship sailings as his Bible was regarded as the export expert. To-day, every firm seriously engaged in the art of export—and few firms to-day are not—has its export manager, an executive of high qualifications and wide experience. It is now, and will continue to be, essential for every exporting concern to employ at least one individual possessing the knowledge and status to enable him to consult, and be consulted by, the senior executives of his firm so that long before production is started a sound policy for sales and distribution shall have been evolved. The export manager in Britain is now a key executive engaged for his qualifications and experience.

It is fortunate, to say the least of it, that, long before the war when the need for exports was not so clearly realized, there were those who had the foresight and initiative to form the Institute of Export, an organization similar in character and purpose to such bodies as the Chartered Institute of Secretaries and one whose members are as skilled in their chosen profession of export as are chartered secretaries, accountants, practitioners of law and medicine in theirs. The Institute of Export will play a most important part in Britain's future welfare by ensuring that the great skill and technical ability of the nation will not be constricted in any way by an inferior export organization.

Education in Export

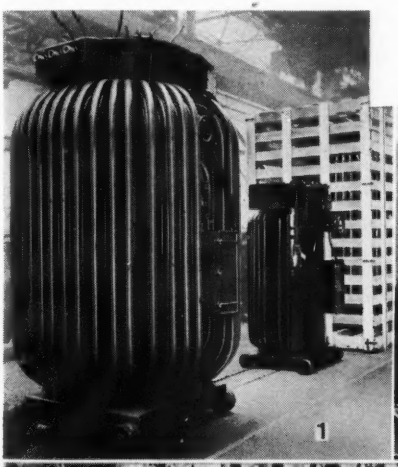
We in Britain have more than an adequate share of the world's finest experts in design and production. The export people will match their genius with equal imagination. Realizing that the whole success of our export trade depends in the last resort upon the efficiency of its administration, the aim of the Institute of Export is that every man or woman employed in an administrative capacity in export trade shall be fully qualified for the work. For this purpose, instructional courses have been arranged at the universities and chief educational institutions throughout the country and students who wish to qualify

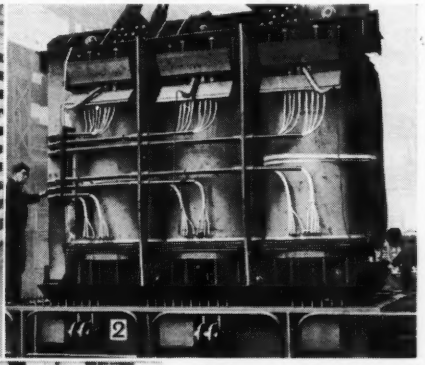
Looking Ahead

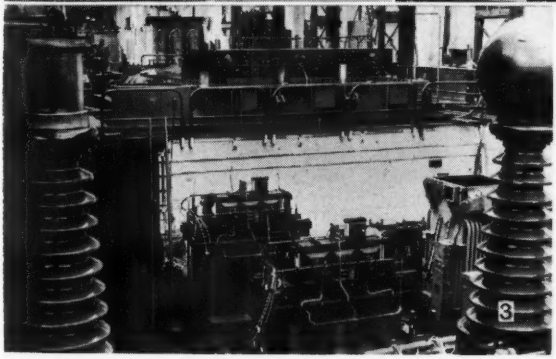
BENEFITS FROM LONG-TERM RESEARCH AND EXPERIENCE

FOUNDED in 1882 by Dr. S. Z. de Ferranti, one of the pioneers of electrical development, the Ferranti Company has for many years won for itself a reputation in overseas markets for a wide range of high-grade electrical products. This reputation has been built up very largely from the company's research work and, as a result, in many instances by its leading the way in the development and design of equipment rather than following established practice. Moreover, this policy has been adopted for investigations not only into new and improved techniques in the construction of electrical plant and apparatus generally, but also into any special features of design necessary to meet abnormal conditions liable to be encountered in any part of the world.

Since the war the company has redoubled its efforts to meet the requirements of overseas markets and engineers have been sent out to all parts of the world to obtain first-hand knowledge of local conditions. Most standard products now made are suitable for service anywhere in the world, it being more economical and practicable to incorporate special protective finishes, etc., in all units rather than have the added complication of making two or more types or grades. Nowadays it is only in rare cases that some abnormal feature has to be introduced.







(1) A group of moving coil regulators for export, including one unit already crated for despatch to New Zealand. (2) 30-MVA transformer for Finland being lowered into its tank. (3) Testing various transformers destined for overseas

Transformers, one of the earliest of

the company's products, are still among the most important branches of the business. In at least two developments now generally accepted as major contributions to technical progress, namely the introduction of surge absorbers and moving coil regulators, Ferranti's can claim to be the pioneers.

The directed oil flow system for transformer cooling also was initiated by the company some twenty years ago. Recent technical development relates to the control and distribution of surge stresses in transformer windings. Of great practical importance, especially in relation to export, is the attention that has been paid to the outline of transformers with the object of eliminating projections to save shipping space and to minimize the risk of damage in transport.

A comparison of old and new d.c. watt-hour meters, showing the reduction in size effected by use of the new anisotropic magnetic materials. (Inset) Glass-fronted meter designed to counter thefts of electricity

A most important aspect of the Ferranti transformer engineering organization, which proves of great benefit to supply engineers installing large electrical power schemes, is its extensive experience in the design and installation of the largest transformers in relatively remote places, having limited transport facilities. This aspect of the company's enterprise has been manifest from the very earliest days of bulk power transmission, when it provided the first 11-kV power transformers in such countries as Chile and New Zealand.

To assist further investigations into the design of transformers, etc., a new laboratory for surge research is being established, while to meet the ever-growing tendency towards higher capacity and voltages an entirely new factory is in course of construction with special facilities for handling the heavy weights of materials involved. Here it will be possible to make large power transformers for voltages of 264 kV or higher, at the same time freeing much-needed space at the Hollinwood factory for the manufacture of the smaller types of equipment.

Construction of Large Sizes

The company can undertake the manufacture of transformers up to the largest sizes built. When we visited the factory recently, the largest under construction was of 64 MVA capacity for Finland, but 87 MVA units have previously been built and 100 kVA units with on-load tap-changing gear are on order for the British Electricity Authority for installation at Leeds. Sixty-nine transformers of from 5 to 50 MVA were in course of construction for South Africa, while for New Zealand there were eighteen units of from 5 to 50 MVA in hand. Among eight transformers for Finland of 9 MVA upwards were a number of 64 MVA three-phase units intended for 230 kV operation. Three 45 MVA types for Portugal were for 150 kV operation and 7,500 kVA units for India and Hong Kong were in hand. Many of the transformers included on-load tap-changing gear.

Welding is employed exclusively for transformer tank construction. All conductors forming the coils of power transformers are paper-covered whilst the major insulation consists of pressboard in various forms and tubes and collars made of bakelized paper. On large high-voltage transformers vacuum impregnation with transformer oil is used and on smaller units coils are vacuum impregnated with linseed oil varnish which

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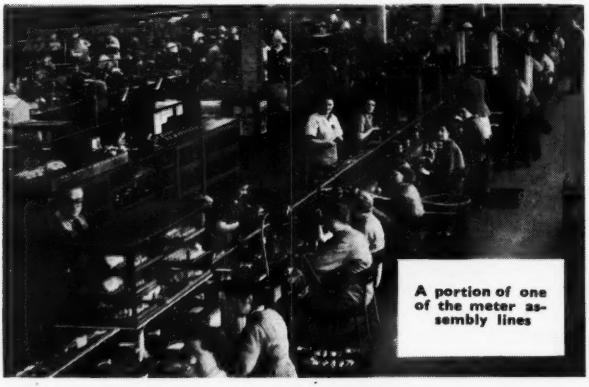
has excellent electrical insulating properties and has the additional advantage of having no acid-forming tendency when the coils are immersed in transformer oil. Silica gel breathers are commonly provided on transformer tanks. Extreme simplicity is the key-note of Ferranti tap-changing gear. Immediately replaceable copper contacts are a special feature of the heavy-duty tap-changing gear. Ferranti moving-coil regulators, high-voltage testing equipment and surge absorbers are on order for a large number of overseas territories.

Meter Production

The company is one of the largest manufacturers and exporters of electricity meters in the country. Overseas interest in Ferranti house-service meters lies largely in the special features incorporated to make thefts of electricity if not impossible at any rate extremely difficult. Apart from the use of meter covers made of " Nomag," a non-magnetic cast iron developed by the company, which is two and a half times as tough as ordinary cast iron and extremely difficult to drill, glass covers are being made available for markets where these are preferred. The cases fracture readily if attempts are made to gain illicit entry, making it a simple matter for the meter reader to detect any interference with the instruments.



A portion of one of the meter assembly lines

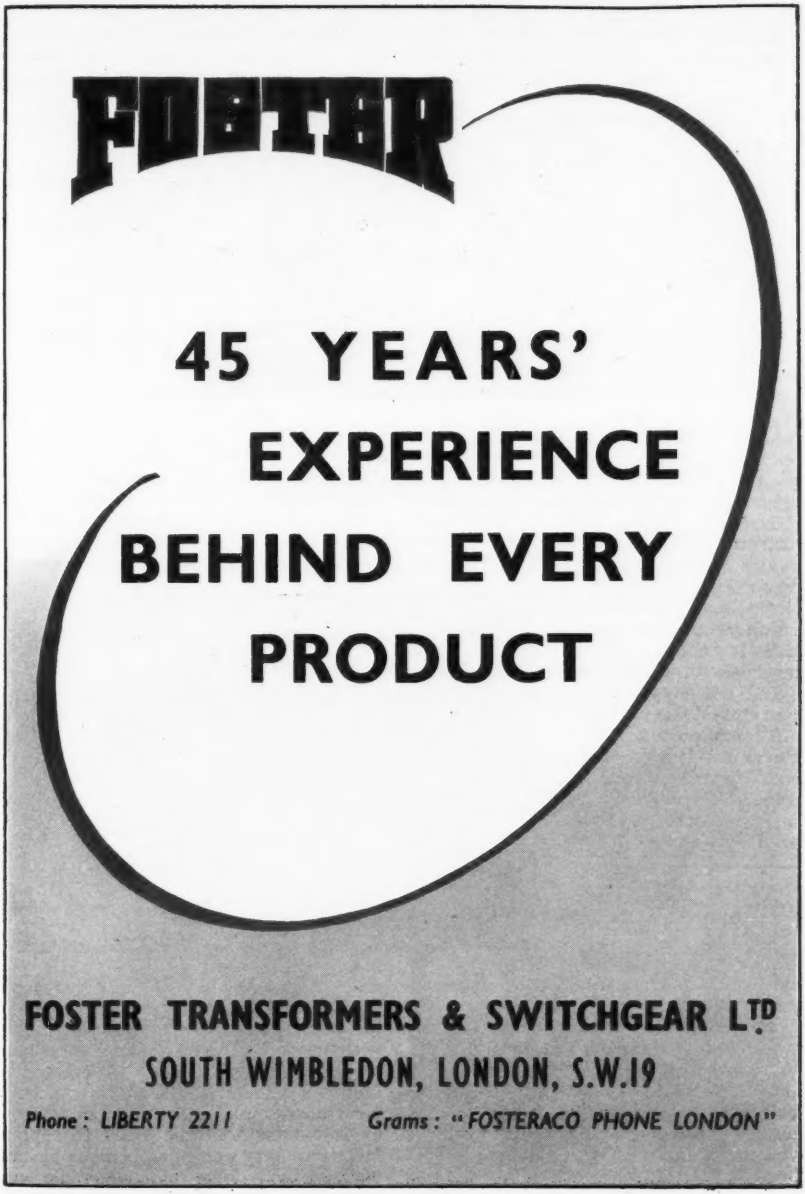
A further modification carried out to meet special overseas requirements is the provision for concentric cable entry, which makes it impossible to tap the supply without causing a short circuit. The company's standard type of meter cover is moulded, though there is a fairly large demand for pressed aluminium.

The inherent features of design of Ferranti meters has enabled them, in either their standard or a slightly modified form, to pass the official requirements of all the principal overseas markets. The continued intensified research and development work of a team of meter specialists makes a considerable contribution to the maintenance of high quality.

By employing the new anisotropic " Alcomax " material in d.c. meters it is now possible to use one small magnet instead of two large ones and, by ingenious arrangement of the components, to reduce the size of a meter by more than half, and its weight by about one-third. This advantage in packing, transport and installation has been accompanied by better performance.

The greatest care is taken both in the use of suitable protective finishes of the metal components and in the choice and fitting of gaskets, especially for instruments intended for overseas. Stringent precautions are taken to exclude moisture when packing. The cartons are packed in wood wool in soldered tin - lined packing-cases.

All the company's standard watt-hour meters are produced at Hollinwood, including both single-phase and poly-phase types. The latter meters embody a single-disc construction, which, it is claimed, results in their being the most compact polyphase meters at present made. Under the flow system of assembly adopted, conveyors are employed for the main assembly, the elements comprising potential and current coils, etc., being built up on one side, and the case back, terminal block and magnet on the other, ready for assembly, inspection and testing at the far end.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Magnets for standard meters are now automatically forged and hardened, only the gap and face grinding, the magnetizing and artificial ageing requiring the supervision of an operator. Similarly all the holes in meter case backs are drilled and tapped in one operation and a multi-riveter is employed in the assembly of the elemen s.

High-frequency equipment finds an application in the pre-heating of moulding material for many items used in production as, for example, tapping switch bases, meter covers, and so on. The speeding up of production by the use of h.f. pre-heating depends on the size and form of the product to be moulded but, in general, it can be said that there is a reduction of approximately 50 per cent in the curing time. In addition, pre-heating enables better and more complicated mouldings to be made, reduces rejects and die wear and allows much lighter presses to be used.

The more special types of meters and instruments are dealt with at the company's Moston works, which also makes domestic appliances, clocks, radio and television sets, meter and radio test panels, valves, power-factor correction condensers, the Ferranti-Wild-Barfield h.f. equipment, the Ferranti-Jeans seed conditioner and "Servodyne" electronic equipment which, though originally designed for cloth guiding, has other applications in paper making, etc.

The testing section of one of the radio assembly lines. The listening cubicles are on the right

Among special instruments electrostatic high-voltage indicators are made for voltages up to 33 kV. Besides simply showing whether lines are alive, they can be employed also for phasing out. A combined instrument having the features of a volt-meter and a clip-on ammeter has also been developed. Much attention has been paid to producing switchboard instruments that will withstand the most severe tropical conditions and a complete range of hermetically-sealed units is now available. With diecast cases and neoprene gaskets these instruments can be immersed in practically boiling water without damage.

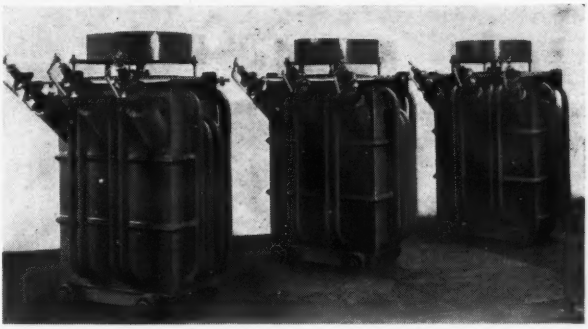
Ferranti's claim to be pioneers in both reflector fires and electric clocks. Fires are available with chromium-plated reflectors, or with the company's own "Solium" finish. Clocks are being made to operate on frequencies of 40, 50, and 60 cycles. Water heaters of various types are made and large quantities of radio equipment have been despatched to India and the Middle East; many other large orders are held up through difficulty in obtaining import permits. The company is ready to meet the large potential demand from the public for television apparatus.

Increased Export Trade

Altogether the total volume of export orders shows an increase of about three and a half times above that of the last pre-war year, and about 40 per cent of the output of transformers, instruments and other commercial and industrial products is sent abroad. The company has gone a long way towards catching up with its arrears of orders and the completion of its new factory is expected to reduce considerably the delivery periods for transformers, which now take from eight months to three years to supply. Meters are now immediately available and instruments, domestic and radio apparatus, clocks and most other products are now available from stock.

Transformer Reliability

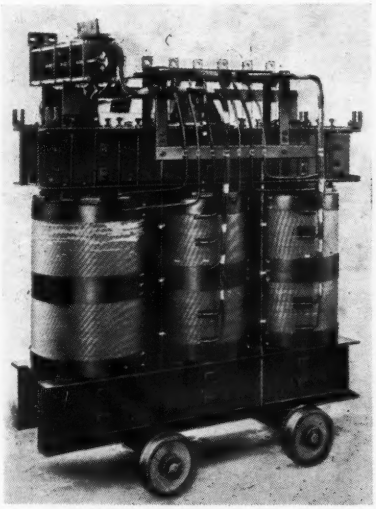
HERMETICALLY SEALED CONSTRUCTION

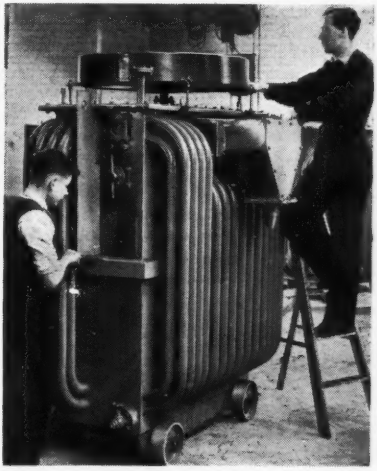


Part of a contract for seventy-two 100 kVA, 11,000/400 V transformers for Southern Rhodesia

LONG trouble-free service of power transformers is dependent largely on keeping the oil dielectric uncontaminated. This can be done to a certain extent by the use of conservator tanks to reduce the contact of the atmosphere with the oil, but maximum reliability can be attained only by completely sealing the transformer.

To achieve this some device is necessary to allow for the expanded volume of oil due to the temperature rise, otherwise a destructive hydraulic internal pressure would be set up in the tank causing distortion and eventually destruction. In the hermetically-sealed transformers made by the Lindley Thompson Transformer & Service Co., Ltd., St. Mary's Road, Middle Green, Slough, relief chambers are fitted which automatically cater for this expanded volume, freely adjusting themselves to the required volume without exerting any undue pressure on the transformer tanks. The chambers take the form of diaphragms constructed of

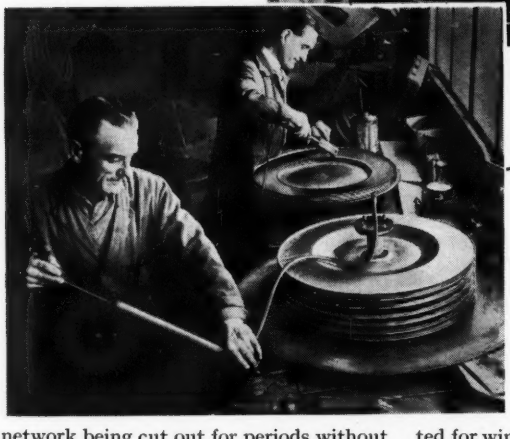




This 1,000-kVA, 10,500/440-V transformer, dismantled for modification, had given satisfactory service for 12½ years. (Right) Fixing the Thompson relief chamber to a 500 kVA, 6,600/433 V transformer

vanes or rings of ductile copper. The number of vanes is varied according to the temperature in which the transformer is to operate: thus more vanes are needed in hot than in cold climates.

Once a transformer is sealed there is no risk of moisture being present as there is no "breathing." This feature permits a lightly loaded unit on the network being cut out for periods without risk of deterioration of the oil. Should a transformer fault occur and a large volume of gas be liberated, the chamber will act as a relief diaphragm and protect the tank from possibly serious consequences: the chamber may be damaged but replacement is not expensive. Service costs are considerably reduced since there are no breathers and oil filtration is unnecessary.



New method of horizontal winding of shell type coils for pit-type hermetically-sealed transformers (above) and soldering together the copper discs forming the diaphragm and testing a completed unit for leaks (left)

For use in conditions of excessive heat or humidity or where there is likely to be flooding hermetically-sealed transformers have proved successful. Being immune from moisture absorption, the transformers do not require drying out on reaching their destination.

Several transformers fitted with relief chambers have been in satisfactory service for from ten to twelve years and in units recently brought back to the company's factory for modification after 12½ years' service the oil has been found to be in its original condition. Although, in general, designs have not been altered materially for some years several minor improvements have been incorporated from time to time and production methods are constantly being modernized. Recently a new method adopted for winding shell type coils for pit type hermetically-sealed transformers has resulted in a more efficient product. No varnish is employed in the construction of coils.

Units are now available for capacities of from 2 to 2,000 kVA. Recently an order for seventy-two (100 kVA, 11,000/400 V) has been completed for Southern Rhodesia.

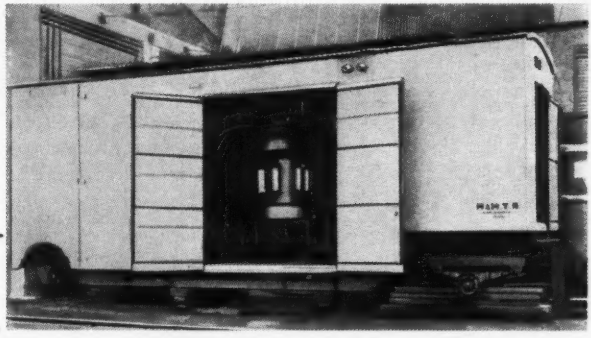
EXPORT ENQUIRY SERVICE

ONE section of our Information Department is devoted to putting overseas buyers in touch with British electrical manufacturers. This can be done directly for specific productions, but when enquirers wish to receive information from a number of manufacturers a note is inserted under the heading "Export Enquiries" and replies are passed on to the interested party. The same service is rendered to firms or individuals overseas who wish to act as agents for British manufacturers.

Australian Rectifier Installations

NEW TRANSPORTABLE EQUIPMENT FOR MELBOURNE

THE first pumpless steelclad rectifier to be installed in Australia was built in England by the General Electric Co., Ltd., at its Birmingham Works, and was put into service at the Preston sub-station of the Melbourne and Metropolitan Tramways Board in February, 1938. When the 600 V twin cylinder equipment was built, doubts were expressed as to the ability of the rectifier to withstand prolonged periods of service without re-pumping. Plans for a mobile pumping unit were considered, but these were eventually discarded. This decision has since been justified by the performance of the unit, which in ten years of trouble-free operation has given over 77,000 hours of service.



Transportable substation housing two pumpless air-cooled cylinder type mercury-arc rectifiers

On two occasions lightning struck the overhead system outside the building, causing damage to plant inside the sub-station. On one of these occasions the rectifier equipment was involved, the insulation of the fan load control reactor being punctured. Re-insulation of the reactor was required, but the rectifier cylinders were undamaged, and the anode fuses did not blow.

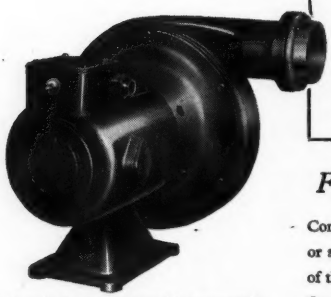
The rectifier works in parallel with existing rotary convertor and rectifier plant feeding a tramways load and has a d.c. output of 1,000 A, with an overload capacity of 100 per cent for 15 seconds. It operates from a 6·6 kV, three-phase, 50 cycle supply.

Shortly after the outbreak of war the Tramways Board purchased two rectifier cylinders identical with those installed at the Preston substation, and built up what is believed to be the first mobile rectifier substation in Australia. The rectifiers and auxiliary equipment are mounted in a box trailer vehicle to form a mobile unit of compact and efficient design. The main transformer, which is of Australian manufacture, is mounted in the rear of the trailer, adjacent to the high-voltage oil circuit breaker and associated switchgear. The incoming 6·6 kV cable is connected to the oil circuit breaker at this end of the sub-station. The twin rectifier cylinders are mounted in the centre compartment, the front of the trailer housing the d.c. switch and control gear.

Post-war extensions to the Melbourne Tramways Board plant include five 600 V 1,000 A single-cylinder G.E.C. rectifiers. Two have been installed at the Holden Street substation, and the third is awaiting a new substation building at Northcote. Apart from the substantial increase in load capacity, these rectifiers are generally similar to those already in service. The units have been designed for use in conjunction with delta to six-phase connected transformers of Australian manufacture, and the rated overload capacity is 100 per cent for one minute.

Diesel Plant for Paris

The French insurance company, Le Phenix, has installed in its head offices at 33, Rue Lafayette, Paris, a diesel electric generating plant comprising a Petter "Superscavenge" five-cylinder engine direct coupled to a "Schneider" 300 kVA alternator.



These Units are being used in innumerable industries, and for many purposes, including the following :

Forge blowing : Forced draught for small furnaces, muffles, gas blow pipes : Radio and rectifier valve cooling : Fume extraction : Ventilation : Swarf collection and disposal.

"Statair" Units can be used in conjunction with "Secomak" Spray Gun, Heater Attachment, etc., etc.

Secomak 'STATAIR' Blowing and Suction Units

For High Velocity Blowing and Suction

Compact, lightweight, easily fitted for use wherever high velocity blowing or suction is required, these units operate at pressures greatly in excess of those to be found in other blowers of twice their size and weight. Air flow can be regulated by means of butterfly valve or variable resistance.

Standard models incorporate combined fan and motor in cast aluminium housing, terminal box tapped ¾ in. conduit, bayonet flanges being provided to inlet and outlet for standard "Secomak" fittings, one protective fan guard and adaptor for attachment of 1½ in. i.d. hose being supplied with each unit. Alternatively a 2-in. B.S.P. flange can be fitted, enabling any standard pipe fitting to be used for connection.

• *Write for Leaflet No. 104/37E for full particulars.*

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AT AN ECONOMICAL PRICE

Not only a high-grade tubing at a competitive price but a great time-saver in conduit installation—"K" Aluminium Electrical Conduit Tubing. Easy to bend, to thread and to set. Quick to cut. Lighter to handle. Will not rust, meaning longer life for tubing and cable. Besides being a good thermal and electrical conductor it is non-magnetic and of attractive appearance.

Available in all the usual conduit sizes, in aluminium or—for extra strength—in aluminium alloy. Supplied with plain ends or screwed with couplings. Let us quote for your requirements.

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Canada Tests Moisture Meters

METERS for measuring moisture content have recently been tested in the Grain Research Laboratories of the Board of Grain Commissioners for Canada. Instruments were submitted by the United Kingdom, the United States and Canada. The Board reported that of the ten instruments tested "... the Mullard meter proved to be the most accurate of those obtained from the United Kingdom; the error of prediction of the instrument was $\pm 0{\cdot}48$ per cent."

According to the report, the major investigation involved the study of 160 samples of Canadian hard red spring wheat covering a wide range of moisture contents. As none of the samples was either dried or wetted, the investigation represented the field conditions which meters might be expected to meet in that country. Duplicate determinations were made with all meters and the split vacuum method and the Brown-Duvel (oil distillation) method were used as controls. In addition, determinations were made of the bushel weights, thousand-kernel weights and ash contents of the samples, so that the possible effect of those factors on the accuracy of the meters might be studied. A separate study was also made of the instruments.

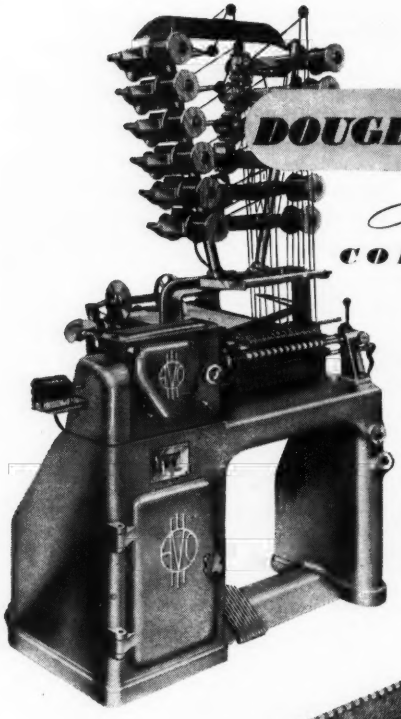
Mr. N. Palmer, chief analyst to Hovis, Ltd., weighing a sample of grain for testing with a Mullard moisture meter

The principle on which the Mullard moisture meter works is the measurement of the change of capacity occurring between two condenser plates when moisture-laden grain is introduced between them, the difference being recorded on a direct-reading meter calibrated in percentages of moisture content.

"Sectric Autocal" alarm clock

ELECTRIC CLOCKS IN THE EMPIRE

MOST of the countries of the British Commonwealth of Nations are customers for "Sectric" electric clocks. The manufacturers, Smiths English Clocks, Ltd., tell us that the most popular models are the "Autolarm" and "Autocal" 24-hour full automatic, self-starting alarm clocks which have a special week-end alarm cut-out for people who do not wish to be called during holidays, etc. There is no need to reset these alarms, depression of the silencing knob will not only stop the alarm but will automatically reset the alarm mechanism for the same time next morning.



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Automatic

COIL WINDERS

The large illustration depicts the new improved "Douglas" Fully Automatic Multi-Winder, specially developed for the high-speed production of large quantities of coils with or without paper interleaving. It will produce round, square or rectangular coils up to 6" each in length and up to 4½" diameter. As many as 12 smaller coils can be wound simultaneously within the total available winding length of 12" at headstock speeds of between 600 and 2,000 r.p.m.

Twenty-two different Coil Winders and Taping Machines are illustrated in our new Catalogue, a copy of which will be sent to interested executives on application.

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Winder House, Douglas Street, London, S.W.1 *Telephone : VICtoria 3404-9*

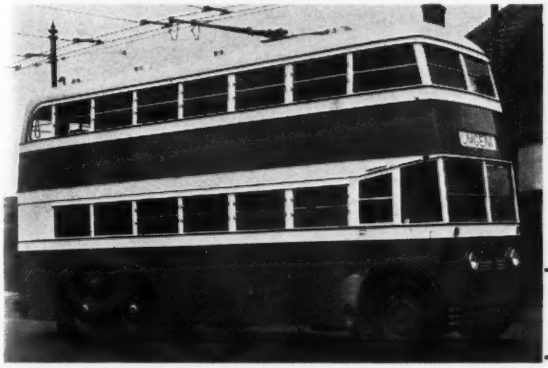
C.2.

The Modern Trolley-bus

A GENERAL SURVEY OF BRITISH DESIGN

By J. H. CANSDALE*
M.I.E.E.

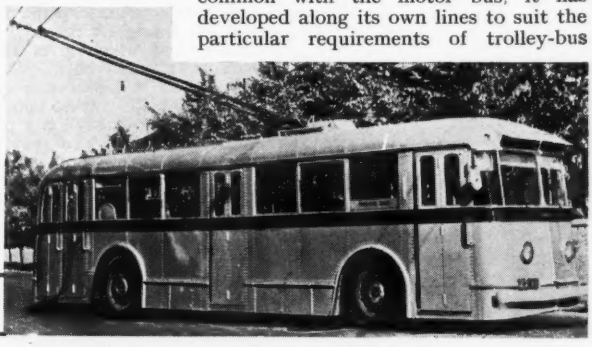
IN London, in 1909, the first British-built trolley-bus was tried out, and the trolley-bus of to-day embodies forty years' experience in the design and operation of these vehicles. In Great Britain they began to come into prominence as public service vehicles in the early 1920s and about 4,800 vehicles are now in service or on order. In the United States they have become popular only during the last ten years and numbers have increased rapidly; the total now slightly exceeds the number in Great Britain. In other parts of the world, notably in Australia and South Africa, there are a number of installations. The trolley-bus is now widely recognized as the premier electric road vehicle. It combines the best qualities of the tram-car and the motor bus; it can accelerate rapidly due to its immense reserve of power; it is flexible in traffic and permits kerb loading; it is quieter than any other public service vehicle and does not emit any fumes. The public likes it because it gives a swift smooth ride; the operator finds that it is economical to run, its maintenance is small and its life long.



Sunbeam trolley-bus fitted with B.T.H. equipment for Durban, 52 in service or on order

The double deck vehicle has been developed primarily for use in Great Britain, where 95 per cent of the trolley-buses are of this type. South Africa also prefers double-deck vehicles, but elsewhere single-deck vehicles are most commonly used and form the large majority of trolley-buses shipped overseas.

Although the chassis has much in common with the motor bus, it has developed along its own lines to suit the particular requirements of trolley-bus operation. A typical two-axle chassis, of a kind frequently supplied for overseas service, has a wheel base of 16 ft. 3 in. and is suitable for a single deck body up to 33 ft. long and 8 ft. wide, giving a capacity up to 38 seats. Where greater



Norwegian-built chassis with Metro-Vickers electrical equipment at Oslo

*Deputy manager, Traction Sales Dept., British Thomson-Houston Co., Ltd.

THROWING NEW LIGHT ON AN OLD PROBLEM . . .

One of the weightiest problems that faces the people who value the appearance of their premises is the problem of lighting. How to get lighting that is bright without being harsh, practical without being plain—and which gives full illumination without running up heavy electricity bills.

The new Crompton 'Aldwych' and 'Albany' fluorescent lighting units more than satisfy these conditions. The 'Aldwych' is a ceiling unit; the 'Albany' is a pendant unit. Both have reeded plastic side panels which provide pleasant diffusion of the bright fluorescent light. Both are light on electricity consumption and easy to maintain.

Crompton can offer a wide range of 2 ft., 4 ft. and 5 ft. fluorescent units of many types and in many styles to anyone who would like to end their lighting problems.

The 'Aldwych' and 'Albany,' catalogue No. AL 2431, house two 80 watt fluorescent tubes and auxiliaries. Besides providing diffused light through the side panels, they give a strong concentration of light below through lattice louvres which also screen the tubes from direct view from normal angles. All equipment is easy to get at and metal-work is corrosion-proof.

Crompton

FOR THE LATEST IN FLUORESCENT LIGHTING

CROMPTON PARKINSON LIMITED

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BRANCHES AND AGENTS IN MOST PRINCIPAL COUNTRIES OF THE WORLD

capacity is required, up to 44 seats, a larger vehicle with a wheel base of 18 ft. 6 in. and suitable for a body with a maximum length of 35 ft. can be supplied.

British United Traction chassis with English Electric 150 h.p. equipment for Sao Paulo, Brazil—one of four vehicles

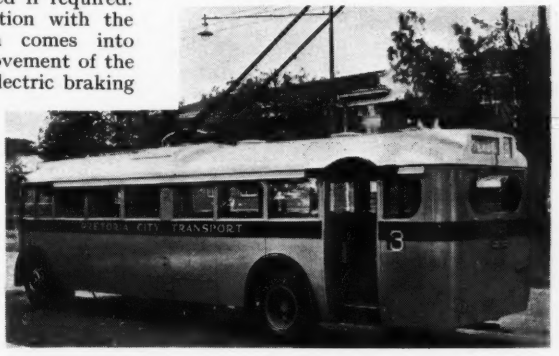
Such a vehicle provides ample standing room so that a total load of up to 75 passengers can be carried. The largest three-axle chassis is suitable for taking a double-deck body having a seating capacity up to a total of 72.

The rear axle is of the underslung worm type with fully floating axle shafts and the ratio varies from $9\frac{1}{3}$ to $10\frac{1}{3}$, depending on service requirements. Air-operated brakes are normally supplied, but hydraulic brakes can be fitted if required. These operate in conjunction with the rheostatic braking which comes into operation on the initial movement of the brake pedal. The use of electric braking which is effective to give adequate service braking down to about 4 m.p.h. greatly reduces brake shoe wear.

British manufacturers have had a long experience in motor vehicle bodywork and various designs of all-metal and composite bodies are available. The all-metal construction, which provides a light but very strong body, is very popular. The space between the inner and outer skins can be packed with aluminium foil, or similar material, to provide both heat and noise insulation. The roof frame is specially strengthened to carry the resiliently mounted trolley base. Doors, air operated if required, can be located at the front, centre or rear to suit local requirements.

Various systems of lighting are available, using either metal filament or fluorescent lamps. As compared with the metal filament, the fluorescent lamp gives a much higher lighting intensity for the same amount of power and this type of lamp lends itself well to use with either direct or indirect lighting fittings. With both types of lamp the supply can be taken directly from the line or, alternatively, from a battery and low voltage generator or motor-alternator set.

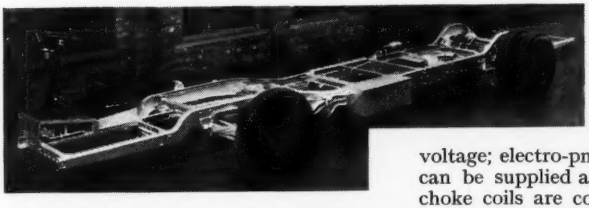
The type of trolley-bus control now generally favoured uses a compound wound non-regenerative motor with rheostatic braking. The motor has a strong series field and the shunt field is used primarily to provide an easily controlled electric brake. By means of a special connection of this shunt field, or by using the bucking action of the series field, the braking torque is maintained substantially



Leyland chassis with G.E.C. electrical gear at Pretoria

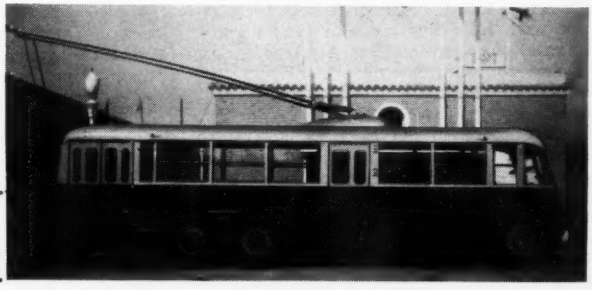
constant over the greater part of the range.

The latest motor is of floodproof design so arranged that it can pass through flood waters up to its centre point without damage. Class B insulation is used throughout and the armature is wound with single turn coils. The motor is capable of accelerating the largest vehicle at a rate of 3 m/h/s and ample overload capacity is provided to meet all conditions of operation. Horse-power ratings range from 95 to 140 (one hour) in accordance with operating requirements.



Sunbeam MF 2.B chassis for single deck body of large seating capacity

The control equipment consists essentially of two circuit breakers, a master controller and reverser, a set of contactors and starting resistors. In the case of single deck vehicles it is usual to mount the circuit breakers and the master controller and reverser in the driver's cab with the contactors in boxes alongside the chassis frame, or at the rear of the vehicle. The resistors are preferably roof mounted, but they may be accommodated on the underframe; this is the usual position in the case of double deck vehicles. A recent development is the assembly of all control equipment, with the exception of circuit breakers and resistors, in a cab control unit which is mounted alongside the driver. The use of this unit simplifies installation and maintenance, but it is only possible when a full cab is available.



Crompton Parkinson 135 h.p. vehicle with pre-assembled Allen West control gear at Zaragoya, Spain

The master controller, which has two separate portions, one for accelerating and one for braking, uses silver-tipped contacts, and operation is either on the scissors principle or by means of cams. It is interlocked mechanically with the reverser, which can only be operated when the controller is in the off position.

The contactors are usually of the electro-magnetic type, with the coils operating at line voltage; electro-pneumatic contactors can can be supplied as an alternative. Small choke coils are connected in the control circuit to prevent radio interference and a condenser unit fitted in the roof of the vehicle and connected between poles and to earth minimizes any interference arising from the main circuit.

An additional feature now frequently incorporated is battery manœuvring. This uses a parallel-series battery arrangement which for normal conditions has the two halves of the battery connected in parallel across the charging generator. To enable the vehicle to be moved for a short distance under its own power a special switch connects the battery sections in series across the motor. This feature is very useful for manœuvring in the garage or for by-passing an obstruction on the road.

Automatic acceleration is a feature which is now becoming very popular. Various means are employed, but they all set the maximum rate at which an equipment can notch up; the driver merely has to put his control pedal right down and the equipment looks after

THE *Charlton* 'TWIN'

DUAL-PURPOSE ELECTRIC WATER HEATER

Provides a complete Hot Water Service from an easily-installed compact unit. It has been designed for installation under the draining board for four reasons: (1) This space, in the modern kitchen, is rarely used efficiently. (2) Gives the shortest pipe run to supply point. (3) Allows simple floor mounting. (4) Unit can be enclosed.

The " Charlton " Twin is the most effective water-heating system for the medium-sized home. Ask for leaflet HD 20 now !

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itself. The arrangement is such that the driver can notch up step by step if required, the control taking over only if he tries to accelerate faster than the maximum setting. Automatic control improves performance since it is no longer dependent on the skill of the driver; it prevents jerky starting and so increases passenger comfort; and it minimizes driving fatigue.

A low voltage supply for lighting and, if required, for door control, can be provided by means of a battery and motor generator set or a generator driven from the main motor. A popular method is to use an overhung generator mounted on the extension of the main motor shaft. The latest type is rated at 1,800 W and cuts in at about 4 m.p.h.

A "dewirement" indicator, which gives audible and visible indication of a trolley dewirement, is a normal fitment, as also is a leakage testing socket which enables the insulation resistance of the electrical circuits to be checked readily before the vehicle goes into service.

The trolley collector is now invariably of the slipper type with carbon insert and this not only reduces wear of the overhead wire but is also less prone to dewirement. Automatic trolley retrievers are not normally used on trolley-buses in Great Britain, but they can be supplied if required.

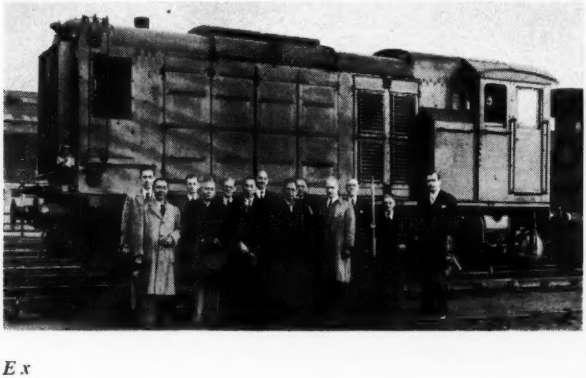
COMBINED MEASURING INSTRUMENT

AN instrument recently introduced by Nalder Bros. & Thompson, Ltd., London, E.8, is already being well received abroad. The "Vectormeter," as it is called, is a new indicating type measuring instrument which enables simultaneous readings of kilowatts, kVAr, power-factor and amperes to be taken at a glance on one dial. It comprises in combination a wattmeter element with a pointer movable in a straight line and a reactive kVA element with a pointer movable in a straight line at right angles to and over the same area traversed by the pointer of the wattmeter.

The measuring elements are generally of the centre-zero type thus indicating export or import power and export or import reactive power, respectively. The dial comprises a series of concentric circles which represent a scale of current. The line which passes through the centre of the circles and through the point of intersection of the two pointers indicates the power factor of the system which may be read off the outer circle. The length of line from the centre of the circles to the point of intersection of the pointers indicates the value of amperes. The "Vectormeter" is eminently suitable for use in the control room of large power stations.

SIAMESE PURCHASING MISSION VISITS BRUSH WORKS

MEMBERS of a Siamese Purchasing Mission recently visited the works of the Brush Electrical Engineering Co., Ltd., at Loughborough. Photographed alongside a "Petter-Brush" diesel-electric shunting locomotive are Luang Charan Snidvongs, Permanent Under Secretary to the Ministry of Communications, who headed the Mission, Luang Thavil Sretha Panichkarn, Luang Vithoon Vithikol and Luang Vithes Yontrakit. The main purpose of the Mission's visit to this country was to buy rolling stock for the Siam State Railways.

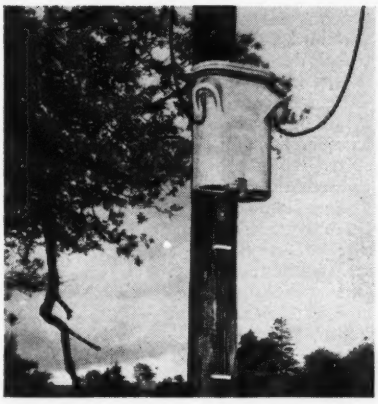


Siamese visitors to the Brush works alongside a Diesel-electric shunting locomotive

Rural Transformers

HERMETICALLY SEALED IN STONEWARE CONTAINERS

FOR rural distribution work transformers hermetically sealed in stoneware containers have very many advantages. In the first place the use of porcelain instead of steel for the containers makes it possible to reduce the size of the units considerably, since, porcelain being an insulator, it is not necessary to worry about clearances. The hermetic sealing prevents the ingress of oxygen and so minimizes the tendency of the oil to acidity,



10-kVA pole-mounted transformer in position

In any case, even if acidity should develop, it is of no great moment since the stonewear container is acid resisting: thus one of the chief causes of failure due to acidity, namely the corrosion of the tank, is eliminated. As yet another safeguard against the possibility of acidity development the windings are impregnated with thermosetting synthetic varnish which is highly resistant to hot transformer oil. The containers are sealed at 95 deg C, far above any temperature at which they will be expected to operate, even in the tropics. In normal circumstances no pressure will be generated inside the tank.

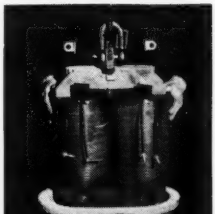
Of especial advantage for service in rural areas, where the load though normally low is liable to heavy peak demands, is the high overload capacity; a 10-kVA single-phase unit is capable of dealing with peak overloads of 15 kVA for five hours, starting cold with ambient temperature not exceeding 25 deg C. Iron and copper losses are claimed to

Batch of 120 hermetically sealed stoneware container transformers ready for despatch

Export order for transformers ready for shipping (below)

be 30 and 40 per cent respectively below the figures usually associated with a standard 10-kVA transformer of conventional design. The reduced copper loss results in low inherent voltage regulation.

Because this type of transformer is well suited to meet the arduous conditions liable to be encountered abroad the manufacturers and patentees, the British Power Transformer Co., Ltd., Queensway, Ponders End, Middlesex, are at present sending the whole of their output overseas. Orders have recently been received for 150 transformers for South Africa, 900 for Eire, 60 for Australia, 50 for Barbados and 10 for Abyssinia. They are proving particularly satisfactory in Barbados, where the life of a steel tank may be as short as twelve months.



Lowering a transformer into its stoneware container

By standardizing their design to a large extent the makers have not only considerably reduced costs but also facilitated service and maintenance. Two tank sizes only are made—one for 2½-kVA units and one for 5-, 7½- and 10- kVA types, all single phase only. Actually the very small difference in the relative costs has resulted in the 10- kVA model being almost always adopted. The transformers are wound for 6·6 or 11 kV and an output of 240 V, tappings being provided to compensate for variations in the supply pressure of plus 3 per cent, minus 3 per cent and minus 6 per cent. The windings are insulated for impulse tests at 95 kV on the h.v. side and at 30 kV on the l.v. side.

Supports are provided for pole mounting, and to assist installation the cradle housing the stoneware container is fitted with lifting hooks and a fixing lug which engages the top of a specially-designed anti-rocking steel bracket bolted to the pole. A bottom support carries the weight of the transformer.

CONTROL EQUIPMENT FOR DREDGERS

THE Brookhirst control panels illustrated are part of the specially designed electric motor control gear supplied for use on five electrified dredging equipments on dredgers which are to be employed in cutting the new canal between Donjere and Mondragon in the South of France. The contract for the supply of the complete a.c. electrical equipment was obtained by the British Thomson-Houston Co., Ltd., Rugby, who sub-let the contract for the motor control equipment to Brookhirst Switchgear, Ltd., Chester. The control gear includes automatic starters for seventeen main motors, ranging from 3 h.p. to 350 h.p. on each dredging equipment. The starters are arranged to work in sequence to ensure correct starting and control of the complete equipment.

Part of the specially designed Brookhirst electric motor control equipment for dredgers to be used in cutting a new French canal

High-Frequency Heating

MANY NEW APPLICATIONS

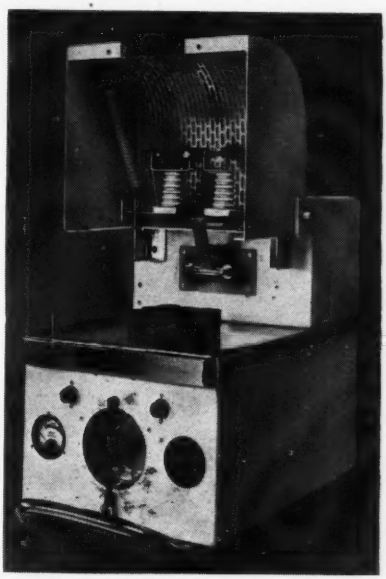
THE number of new applications of high-frequency heating is continually being added to. Apart from the preheaters now in general use in plastic moulding factories, equipments are now supplied for such purposes as medical diathermy; soldering, brazing and hardening; accelerating setting of synthetic glues for the woodworking industry; the setting of rayon yarn twist; the continuous preheating of raw materials for resin-bonded sawdust board; and the production from p.v.c. leather cloth of wallets, garments, inflatable toys, beach cushions, etc.

"Radyne" plastic preheaters are claimed to be in use in half the plastic moulding factories in Great Britain; the smallest equipments are capable of plasticizing 2 oz of powder per minute, the largest dealing with 3 to 4 lb per minute. In co-operation with a number of plastic moulding companies, the manufacturers of the apparatus, Radio Heaters, Ltd., Toutley Works, Wokingham, Berkshire, have produced a special brochure to acquaint overseas moulders with the actual production improvements which have been obtained in this country.

For the welding of p.v.c. and other plastic sheeting a range of five equipments is available capable of undertaking welds from 1 in. long up to 12 ft. in total profile length. Two high-frequency induction heaters of 1 kW and 5 kW loading are finding extensive applications in the engineering and metallurgical industries, and larger equipments up to 50 kW output have been designed. Moisture testers, employing dielectric heating, incorporate a balance, the pan of which hangs freely between the high-frequency electrodes, thus permitting the sample to be weighed continuously during the drying process.

Moisture Testers

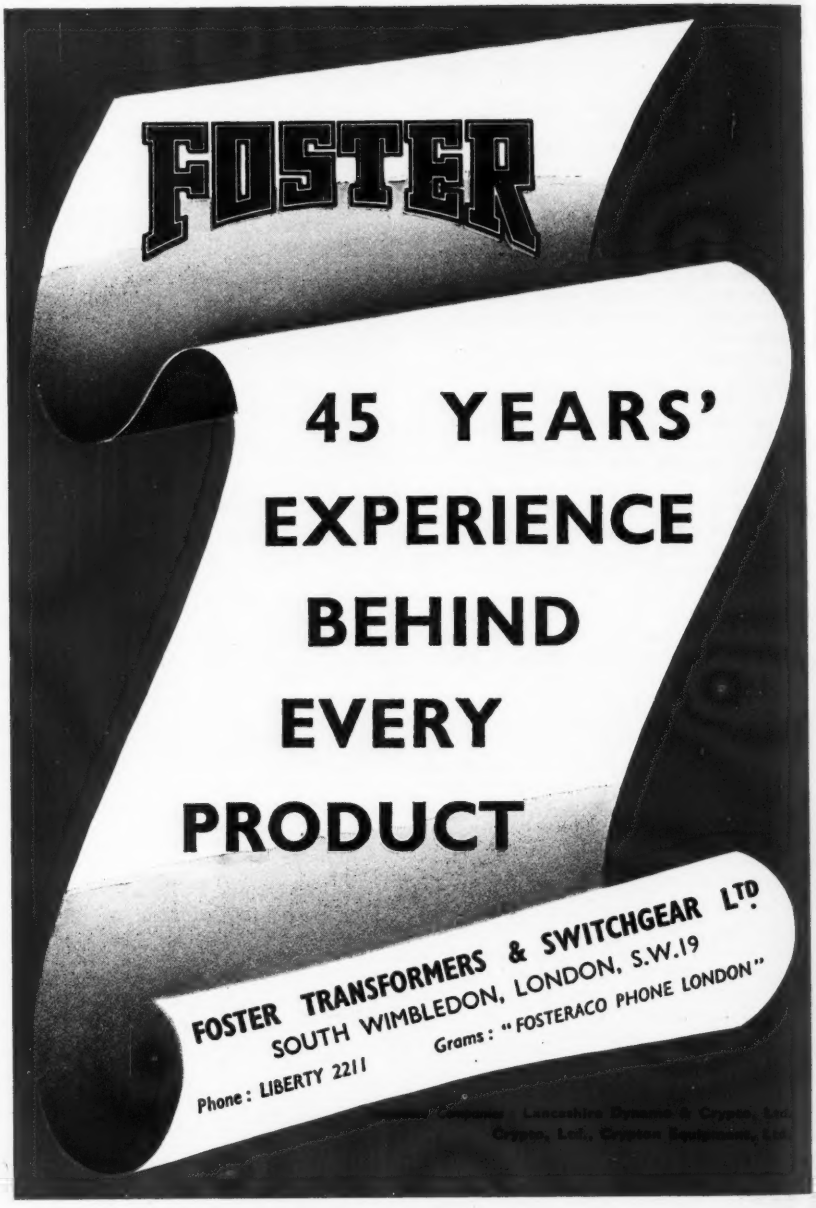
In addition to direct exports to a number of countries, British firms have themselves taken out equipments to their factories overseas. A leading firm of manufacturing chemists is shipping out moisture testers for its new factories in India. Amongst the various equipments exported are considerable numbers of high-frequency plastic sheet welders, small induction heating equipments, plastic powder pre-heaters and many equipments specially built to customers' requirements.



"Radyne" high-frequency oven

TRANSFORMERS FOR AUSTRALIA

AN outstanding feature of the English Electric Company's recent export transformer business has been the large number of big transformers for which the orders have been received from Australia. One interesting application is a 68/34 kV 35 MVA regulating transformer equipment for the Electricity Trust of South Australia. Other orders include five 30 MVA 110 kV transformers for Tasmania and a number of 30 MVA, 20 MVA and 15 MVA 110 kV transformers for Brisbane. The New South Wales Railways have ordered two 44 MVA and two 55 MVA transformers for service on their 132 kV system.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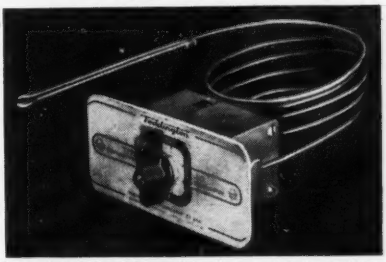
Temperature Control

AUTOMATIC control of temperature has perhaps even greater scope abroad than at home, where in general the more temperate conditions do not emphasize to the same extent the need for the control. Instruments for automatically regulating the degree of heating or refrigeration are available for all industrial, commercial and domestic purposes, and one of the largest manufacturers, the British Thermostat Co., Ltd., Sunbury-on-Thames, is sending abroad considerable quantities of all types, together with its other products, which include pressure controls and gauges; thermostatic, magnetic and motorized valves; gas pressure switches and relays.

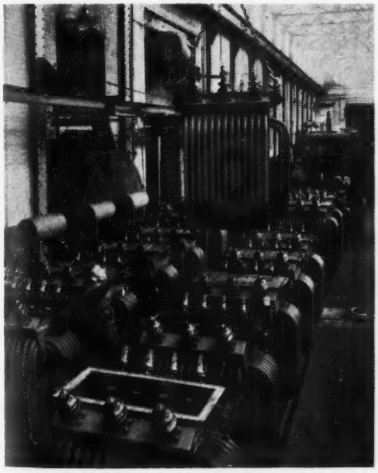
Normally standard instruments as supplied to the home market are sent abroad, but sometimes, where orders are sufficiently large to make it economical, the company modifies its products to some extent to suit overseas demands or standards. In any case the standard instruments are available with scales in either Fahrenheit or Centigrade and with nameplates in foreign languages according to the customers' requirements. In most overseas countries the company has exclusive agents and in others it exports direct to distributors. Both agents and distributors are able to give advice on technical matters.



Type "NQ" refrigeration thermostat is available with nameplates in English, French or Spanish

POWER TRANSFORMERS FOR COLOMBIA

IN April we reported that in competition with United States firms, the British Electric Transformer Co., Ltd., had obtained a $120,000 order for forty-five power transformers for a public supply company in Colombia, South America. By reorganizing a production schedule, and with the co-operation of the employees, the manufacturing time was reduced to a minimum and the transformers are now being delivered. The order comprises ten 400 kVA, fifteen 300 kVA, and twenty 200 kVA, three-phase, 60 cycle, double-wound transformers, totalling 12,500 kVA.



Ready for delivery to South America: part of a consignment of 200 kVA, 300 kVA, and 400-kVA outdoor distribution transformers manufactured by the British Electric Transformer Co., Ltd.

Other export orders recently received by the Company, which is associated with Crompton Parkinson, Ltd., include thirteen 750 kVA transformers for Egypt and two 5,000 kVA transformers for the Government of Uganda.

MOTORS FOR INDIAN MILLS

Mr. K. M. Modi, of the Modi Spinning and Weaving Mills Co., Ltd., Modinager, Meerut, India, recently placed an order with the Hopkinson Electric Co., Ltd., for a considerable number of drip-proof and totally enclosed, fan cooled motors in sizes ranging from 2 h.p. to 50 h.p. The despatch of these motors has now been completed well within the stipulated time.

P-D

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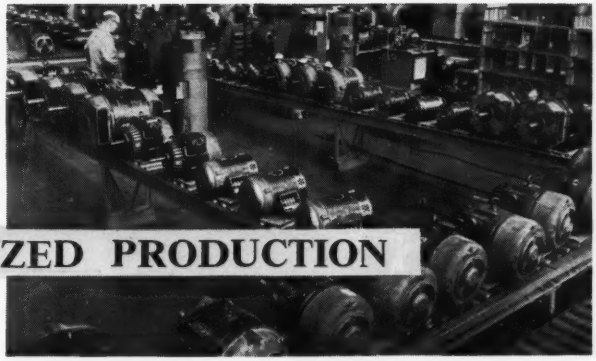
TH IRTY-SIX YEARS' CC NCENTRATION)N ELECTRIC MOTORS

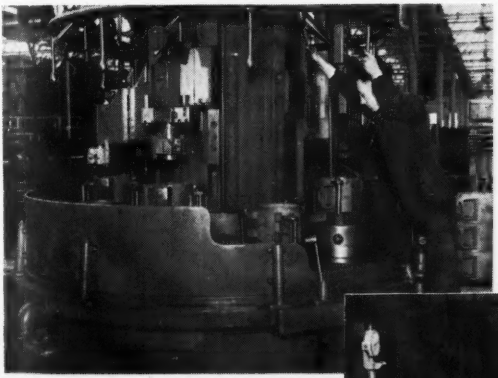
SPECIALIZED PRODUCTION

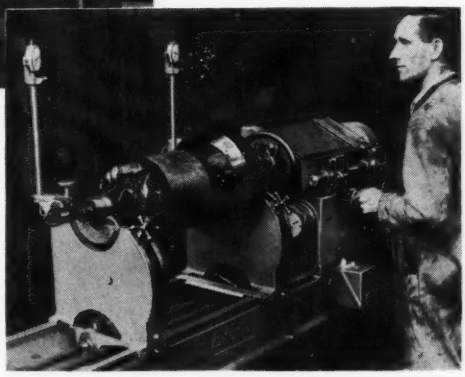


Motors undergoing final inspection and test

COMPARATIVELY few of the many companies which manufacture electric motors confine their activities exclusively to this one product. It is, therefore, something of an experience to visit a factory which, extending over an area of no less than 15 acres, produces nothing but motors and generators. At Witton, Birmingham, Higgs Motors, Ltd., have followed this policy of concentration throughout the whole of the 36 years of their existence with the result that they now manufacture one of the most complete ranges of motors in the country; there are in the company's catalogue ratings and particulars of nearly 30,000 different types, from $\frac{1}{3}$ h.p. to 500 h.p., a.c. and d.c., suitable for all standard supplies throughout the world. Moreover, these figures do not include thousands of standard ratings not listed.

The growth of the organization has been truly remarkable. It started in 1912, as a typical "back alley" firm, the whole factory being driven by a 3-h.p. motor and the total wages amounting to about £6 a week. The original site of the works was only 0·037 acre. All the subsequent expansion has been carried out without the aid of outside capital. Shortage of capital has compelled the company to be prudent, but



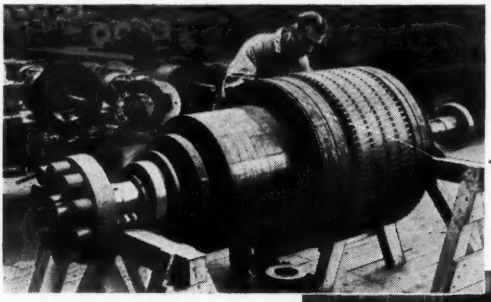


Shells of the smaller types of motors are machined at the rate of one every five minutes on this multi-automatic machine and (right) dynamic balancing of a rotor

throughout its career a strong spirit of enterprise has been in evidence.

To-day, the company has a well-laid-out factory equipped with the most up-to-date plant. Practically every machine is individually driven and conveyor systems have been employed for assembly wherever possible. Recent new additions to the equipment installed which will further speed up production are multi-automatic machines employed for machining the shells of motors up to 3 h.p. Incorporating eight movable stations, each of these machines enables a single operator to turn out at the rate of one every five minutes, finished shells which have been bored complete with spigot and grooves. Large numbers of multi-spindle drills, vertical millers, and duplex mills are employed and shortly a new press will be installed which will produce complete rotor and stator stampings.

Great pains are taken by exhaustive test at all stages of production to ensure reliability of the motors; the company's reputation has been built up on the long-trouble-free service of its products. It is not an exaggeration to claim that the average electric motor will outlive the apparatus it is designed to drive. Actually, the first motor to be completed by the company, in 1912, is still working and not long ago it was reported that a motor exported to South Africa in 1931 was continuing to do its duty.



Rotor of a 500 h.p. variable speed commutator motor

Winding stators of 25 h.p. motors

Section of the motor assembly department where some of the smaller units are made

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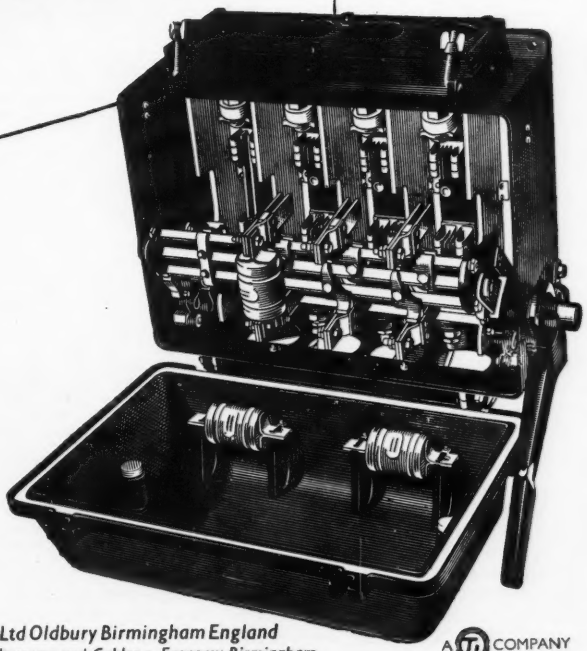
FOR SWITCHGEAR

The Simplex range of Ironclad Switch and Distribution Gear includes 'Monarch' Switches and Switch Fuses 100/150 Amp. and 200/300 Amp. capacity, 500 Volts Double Pole, Triple Pole, and Triple Pole and Neutral types



Simplex Electric Co Ltd Oldbury Birmingham England
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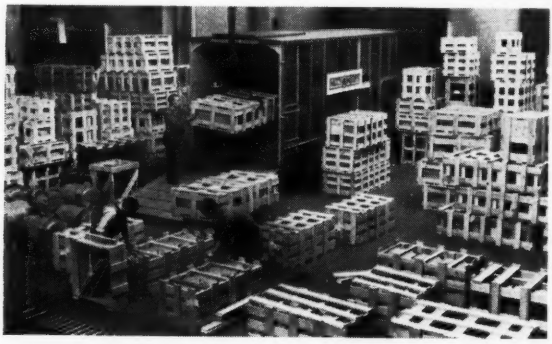
A TI COMPANY

From very early days the company's business has been built up on its overseas trade. Even before the war about one-third of production went abroad as direct exports, apart from the considerable quantity that was incorporated as part of other manufacturers' products. Nowadays, at least half of the motors made are being exported either directly or indirectly. This achievement is all the more remarkable when it is taken into consideration that the company's production of motors generally has doubled since before the war. Recently, output has been rising especially rapidly, last year's figure being 60 per cent. higher than that for 1947. All motors supplied are suitable for tropical conditions and all windings are treated with acid-resisting spray after impregnating.



Awaiting dispatch when we visited the factory recently were units for Lisbon, Cape Town, Alexandria, Jamaica, Uruguay and Australia.

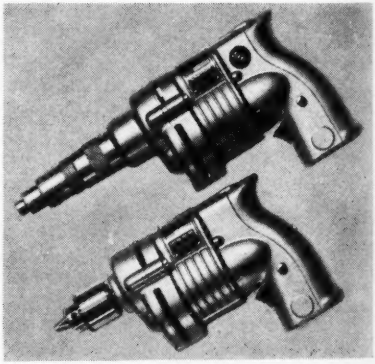
Export despatch department

Export business, though not without its difficulties, apparently has its brighter side. Currency is frequently a problem and on one occasion, to pay for a consignment of machines destined for Reykjavik, the company was offered, and accepted, a consignment of fish. These unorthodox methods of trading are not, however, encouraged!

PORTABLE TOOLS

OVER 50 per cent of all the portable electric and pneumatic hand-power tools produced by Desoutter Brothers, Ltd., The Hyde, Hendon, London, N.W.9, are at present going abroad. The latest electric drill guns and screw guns are of an entirely new design, which, though retaining the best features of the previous range, incorporates a motor with 10 per cent greater power and straight-through ventilation. A trigger switch with a lock for continuous running is fitted in the handle and the screw guns can be supplied with a reversible switch if required. Drill stands and bench clamps are available for all models.

Both drill guns and screw guns weigh 2 lb 10 oz. The former, which run at 2,500 r.p.m., will drill up to $\frac{1}{4}$ in in steel; the latter, running at 1,400 r.p.m., can deal with No. 8 wood screws. As in former models, several features have been embodied with a view to securing long life and low maintenance costs. Former-wound industrial type armatures are used, together with heat-treated nickel-chrome-molybdenum helical gears. Ball-bearings are employed throughout.



Type DG 250 electric drill gun and (top) type SG140 electric screw gun with reversing switch

A new miniature automatic pneumatic screwdriver, $\frac{7}{8}$ in in diameter, and weighing only 8 oz, has also just been released for export. The rotor runs at 14,000 r.p.m.

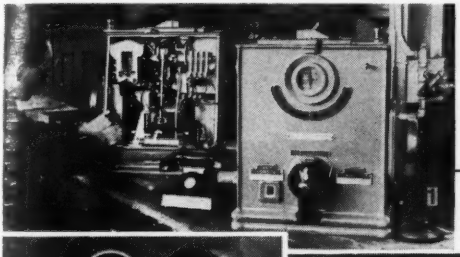
Railway Signalling

GROWING INTEREST ABROAD IN BRITISH EQUIPMENT

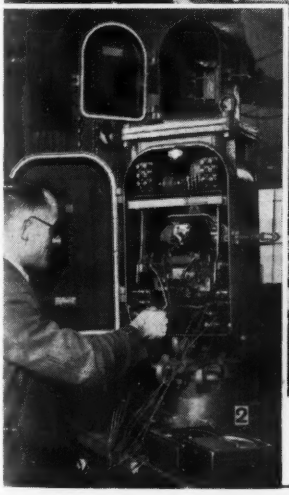
AS in the development of railways themselves Great Britain can claim to be the pioneer of railway signalling. The first interlocking signalling patent was taken out by John Saxby in 1856, since when a whole succession of devices for securing increased safety in travelling have originated in this country and in particular from the various successors of Saxby & Farmer, the firm Saxby started to develop his ideas.

Even in the very early days of signal development electricity began to find its applications, but with the formation in 1907 of the McKenzie Holland & Westinghouse Power Signal Co., Ltd. (since amalgamated with the successor of the original firm to form the present Westinghouse Brake & Signal Co., Ltd.), progress in this direction was greatly accelerated. To-day the Westinghouse Brake & Signal Co., whose activities also cover electro-pneumatic brakes, transformers, rectifiers and colliery equipment, supplies a very high proportion of its signalling equipment designed for electrical operation.

This equipment is now being used all over the world and since the war in particular there has been a growing interest in it. Members of a Siamese Purchasing Commission, recently visiting this country seeking locomotives, rolling stock and railway equipment, went to the company's works at Chippenham to see the latest signalling inventions and improvements. They paid particular attention to equipment specially designed for working single-track lines which form the greater part of the railway system in Siam. Among this were examples of Neale's instruments being made for India and elsewhere. Though developed about 50 years ago, improved designs of these instruments are still regarded as providing one of the safest and most reliable methods of single-track control.



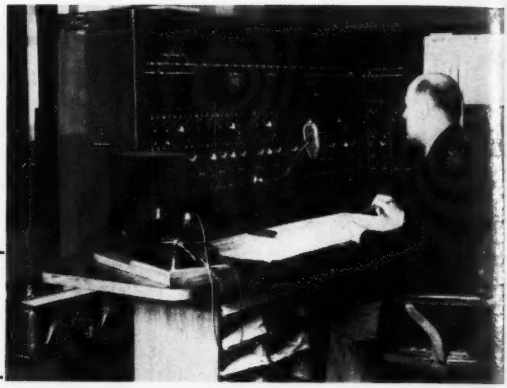
(1) Neale's instruments for single track operation being assembled to meet an order from India



(2) Searchlight signals being adjusted. (3) Power frames in course of construction

In a more recent development, coloured light signalling, two principal systems are employed : multi-aspect signals in which a number of different coloured lamps are utilized, and searchlight signals, in which only one lamp is used in conjunction with coloured roundels or lenses.

An important contract for one of the former systems was concluded two years ago for the equipment of the São Paulo Railway of Brazil. After some delays occasioned by negotiations for the transfer of the railway from its British owners to the Brazilian Government, despatch of the apparatus was begun recently and in the week commenced 29th November, the largest shipment of signalling equipment ever made from the works, comprising about 250 cases, left Chippenham for Brazil.



Control panel for the Wellington-Paekakariki section of the New Zealand Government Railways, showing train graph, loudspeaker and microphone for train control

Centralized traffic control is among the latest developments. By this device an operator sitting at a panel can send, usually along a single pair of wires, impulses which are picked up, decoded and translated into action in the way of operating signals and points. At the same time impulses are returned to the operator to show him that the required operations have been carried out. By this method the complete control of a section of railway can be undertaken with the utmost safety by one operator. New Zealand, perhaps the most progressive of the Dominions in the matter of railway signalling, is especially interested, and has already completed many installations.

Multiple lamp route indicator for Burma with (below) mechanism exposed

An example of this type of equipment in course of construction when we visited Chippenham recently was automatic point setting equipment for use in the Prospect hump yard, near Cape Town. Another order being completed for South Africa was for five electrically interlocked power frames, which are made with up to 83 levers, for controlling signals and points. A similar power frame was also being constructed for Chile.

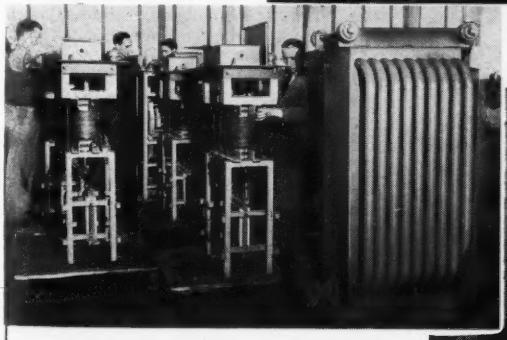
For use in case of failure of electricity from the mains or for situations where no mains supply is available, the company provides complete power supply units. These are equipped with protection against overload, low oil pressure and failure of water circulation.

Power supply panels for Burma

Some of these units are now being supplied to Brazil and Burma.

As already mentioned, signalling equipment represents only a part of the company's work. Its electro-pneumatic brakes are in good demand and recently large orders have been received from, among other places, Australia and New Zealand, for types similar to those now adopted as standard on the London Underground railways. From Holland there is an order for electrically operated compressors for a new type of brake, working at a higher pressure than usual, for high-speed passenger trains.

In September the company celebrated the 25th anniversary of its Rectifier Department, whose products range from copper oxide units $\frac{1}{2}$ in. long, suitable for use as detectors, for automatic volume control, etc., in radio sets, to "Westalite" rectifiers for battery charging (up to 2,400 W), cinema projector arcs, a.c. to d.c. change-over work, electrostatic precipitators, etc. A



Part of the oil-immersed rectifier department

Testing "M4" relays (above) and assembly of a transformer for an oil-immersed rectifier set (below)

high proportion of this apparatus goes abroad. One minor but nevertheless interesting use of one of the smallest types reported from Sweden is for operating electric cattle fences. Transformers, too, are made in various capacities for use with the company's own electrical apparatus.

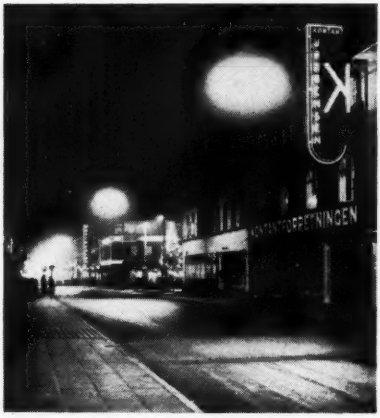
Altogether well over a half of the output generally is going abroad, and there are actually 67 countries on the company's list of overseas customers. Largely with the object of further extending its sales abroad, the company has just completed a large laboratory complete with the most up-to-date equipment, where it will be possible to give even more exhaustive tests than hitherto to apparatus intended for service overseas.

Street Lighting in Denmark

FIRST INSTALLATION OF ITS KIND

A FLUORESCENT street lighting installation has recently been put into commission in the main street of the Danish port of Esbjerg. The switching-on of the new lighting took the form of a public function at which the Mayor, Mr. Hoyer-Nielson officiated. It is the first street-lighting system of its kind in Denmark and, it is hoped, will be followed by further installations.

In all, 34 lanterns, supplied by the export department of the British Thomson-Houston Co., Ltd. (represented in Denmark by Tage Olsen, Copenhagen) are now in operation. In the main street, Kongensgade, there are 28 lanterns mounted on catenary wires within a distance of about one kilometre and spaced at 25 to 30 metres apart. In the town square, six lanterns are mounted on columns.



B.T.H. fluorescent street lighting in Esbjerg, Denmark

These lanterns are constructed from light silicon-aluminium castings with a sheet-metal roof, and a clear plastic cover held in position by four toggle catches. All the auxiliary gear is housed within the lantern, and it is only necessary to open one of the hinged end covers to change the lamps and starters. Each of the three 80-W 5-ft fluorescent lamps has its own anodized aluminium reflector, and anti-glare shields modify the light distribution so as to permit 97 per cent of the available light to be put to effective use.

The particular type of lantern used in the Esbjerg installation, the SLB.751, is specially designed for catenary mounting. Four pulleys are bolted, one to each corner of the lantern chassis and draw wires, fixed to anchorages below two of the pulleys, enable the lantern to be drawn along the span wires so that maintenance can be carried out in greater safety at the side of the road.

CLOCK EXPORT TRADE

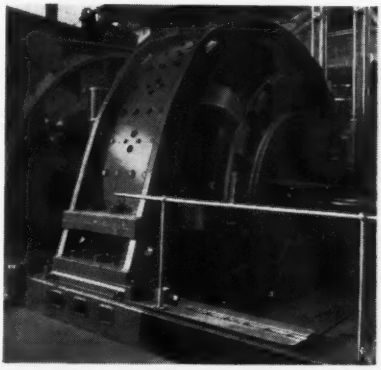
A BOOKLET setting out in alphabetical order by countries their agents in overseas markets has been prepared by Smiths English Clocks, Ltd., Sectric House, Cricklewood, London, N.W.2, who claim to handle the bulk of the clock and watch exports from Great Britain. The company informs us that it is undertaking advertising in many leading countries.

Equipment for Large Winder

INSTALLATION AT THE CROWN MINES, JOHANNESBURG

A LARGE electrically operated winder has recently been put into service at the No. 16 Shaft of Crown Mines, Ltd., Johannesburg. The equipment winds from a depth of 3,435 ft and is used for rock, men and material as desired. There are two drums, 14 ft diameter by 5 ft wide, each drum being clutched to the main shaft. The direct coupled d.c. winder motor has a rating of 2,140 h.p. r.m.s., 5,350 h.p. peak, at a speed of 57/0/57 r.p.m. at 650/0/650 V. It is controlled by a Ward Leonard motor-generator set running at 500 r.p.m. The generator has an output of 1,700 kW r.m.s., 4,240 kW peak, and is driven by a 2,200 V, three-phase, 50-c/s slipring motor with a continuous rating of 1,800 h.p. and a peak rating of 4,500 h.p.

For winding rock the skips have a weight of 10,500 lb each, and the equipment handles a rock load of 12,500 lb. An average output of 170 tons per hour is achieved when winding at a speed of 2,500 ft per minute. The cage for winding men weighs 8,000 lb and has three decks, each accommodating sixteen men. With an average weight of 150 lb per man, the man load is 7,200 lb and about 1,150 men per hour are handled at a speed of 2,000 ft. per minute.



Large d.c. winder at the Crown Mines, Johannesburg

The whole of the electrical equipment was manufactured by the General Electric Co., Ltd., and supplied through the British General Electric Co., Ltd., of Johannesburg. The new equipment replaces a smaller winder, for which the G.E.C. supplied the electrical drive. This winder is now in service in No. 17 Shaft.

TELECOMMUNICATION DEMONSTRATION IN PORTUGAL

ENGINEERS of Mullard Electronic Products Ltd., have returned to England after an extended business trip to Portugal, where they demonstrated telecommunications equipment before leading members of the Portuguese Government authorities.

The equipment, which was carried in a demonstration vehicle, comprised mobile and static radio transmitters and receivers, and the way this equipment withstood the rigours of the journey is a testimony to the quality of British components and design. On arrival in Lisbon, the party carried out a series of very successful demonstrations before senior representatives of the Portuguese Army, Police, Post Office and other Government Departments and business firms.

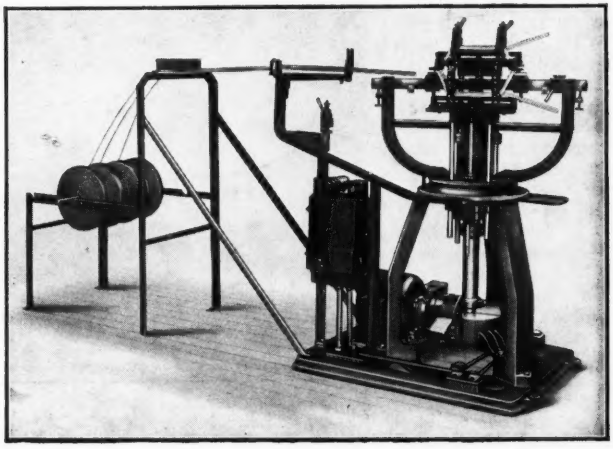
Two of the principal features of the equipment are its insensitivity to noises produced by car ignition, etc., and the ability to work several equipments on the same wavelength without mutual interference.

On the return journey the equipment was displayed in France. Some of the orders resulting from the visit have already been executed.

DUNEDIN CABLE CONTRACT

BRITISH Insulated Callender's Cables, Ltd., referring to the laying of an 11-kV cable across the Otago (New Zealand) Harbour, illustrated in our issue of 26th November last, state that although they supplied the cable, the laying was carried out by the Dunedin City Council Electricity Department (city electrical engineer, Mr. G. T. Edgar) in conjunction with the Harbour Board officials.

QUICKWAY ARMATURE AND MDC LTD COIL WINDING MACHINES



"Quickway" Adjustable Coil Winding and Forming Machine for making shaped Armature and Stator Coils in all sizes from 2 h.p. to 500 h.p., and with all kinds of conductors.

La machine réglable "Quickway" pour l'enroulement et la formation de bobines, servant pour la fabrication d'armatures à façon et de bobines de stators de toutes les dimensions depuis 2 HP. jusqu'à 500 HP. au moyen de conducteurs de tout genre.

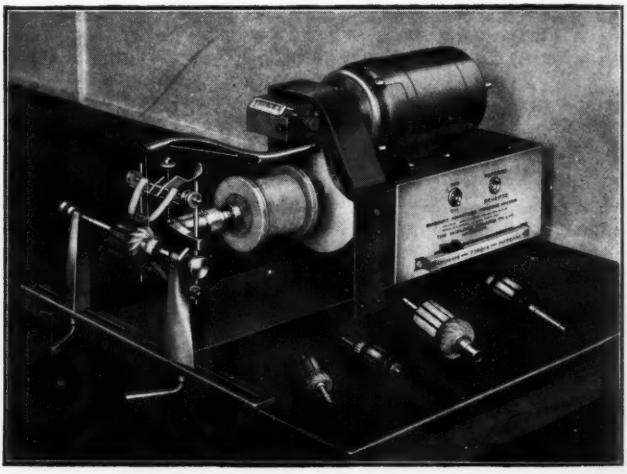
Enrolladora y Formadora ajustable "Quickway," para hacer inducidos persilados y bobinas de estator en todos los tamaños desde 2 HP hasta 500 HP, y con conductores de todas clases.

FOR PORTABLE ELECTRIC APPLIANCES

"Quickway" Adjustable Armature Winding Machine. Lays up to 400 turns per minute of 45 SWG to 24 SWG.

Les machines réglables "Quickway" pour l'enroulement d'armatures. Capacité de travail 400 tours par minute de 45 SWG à 24 SWG.

Enrolladora ajustable de inducidos "Quickway" que enrolla hasta 400 vueltas por minuto de 45 SWG a 24 SWG.



THE MIDLAND DYNAMO CO. LTD. 64 BELGRAVE GATE

TELEGRAMS "DYNAMO" — **LEICESTER, ENGLAND** — TELEPHONE 20172/3/4

Assembling direct-on starters with interlocked isolators

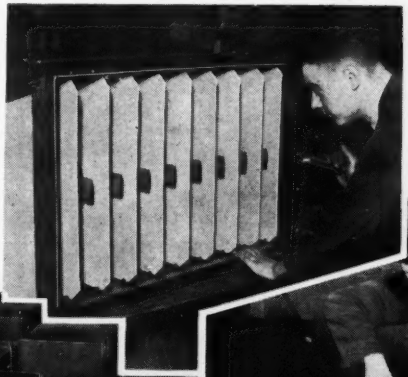
Control Gear

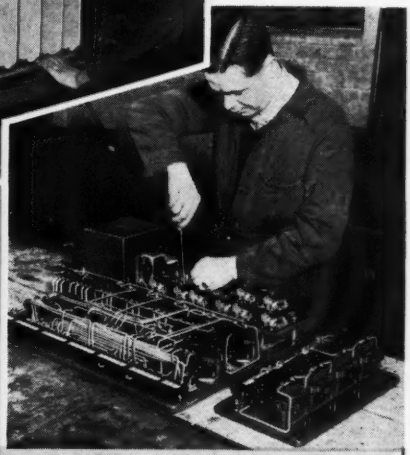
IMPORTANCE OF USING CORRECT EQUIPMENT

FEW and far between though failures in electrical machinery are, the possibility of their occurrence cannot be overlooked. The breakdown of a single piece of apparatus may conceivably seriously upset production in a factory or affect the operation of some vital public service, while the safety of personnel may even be involved. Any precautions taken to avoid breakdowns are therefore likely to be well worth while. Though frequently the cause of a failure is attributed to the burning out of a motor, the latter is usually found to be blameless, the root of the trouble lying in the use of unsuitable and insufficiently protective control equipment. The same is true with regard to non-mechanical appliances.

Having been in existence since 1906 as specialists in switch fuse and motor control equipment the Donovan Electrical Co., Ltd., Safuse Works, Northcote Road, Stechford, Birmingham, can justifiably claim to have experience in its manufactures and to be in a position to advise its customers as to the appropriate types of apparatus to use. In most cases the company is able to meet requirements from its wide range of standard products but a considerable amount of special equipment is also made to meet orders from overseas.

Recently we paid a visit to the company's works and

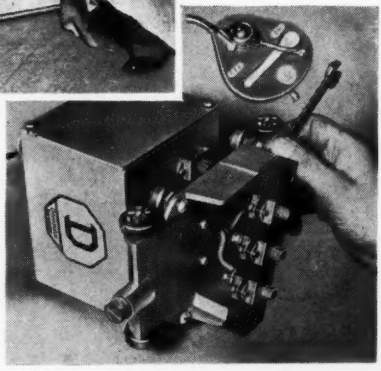




"Donlok" 400-A triple-pole and neutral change-over switch (top); five-motor relay panel for building into a machine tool (above); a.c. motor starters with d.c. control (left)

Control Gear—*continued*

were able to see typical examples of up-to-date practice. One of the first items we inspected was a direct-on starter for motors up to 75 h.p. for use in wire drawing. Close by was a part of a shipment of starters with special tropical finish for Indian cotton mills. Many built-in control panels for brass-working lathes were also being assembled for service abroad, together with various types of star/delta starters, automatic slip-ring starters (some with facilities for inching), primary resistance starters for multi-bar screwing machines, direct-on starters with built-in isolators, relay panels for building into machine tools, and special units for use in a large chemical works comprising standard starters with transformers for low-voltage lighting and relays.



"Scrutact" fusegear (above); overhead busbar travelling conveyor for feeding machine tools (right)

Practically all the starters are supplied fitted with overload protection, either of the magnetic or thermal type. Where quick tripping is required as in the case of material-handling machines, crane control, cutting machines, woodworking machines, etc., the magnetic overload is almost always employed; this type of overload also scores in being generally more robust than the thermal relay, easily adjustable, and not requiring hand resetting, a point of especial advantage in built-in gear. On the other hand, thermal relays are considerably cheaper, do not suffer from "creeping" on heavy and successive overloads as magnetic overloads do, stand up better to dusty and dirty situations, and do not require any maintenance.

Gear for use with cranes is a speciality of the company and apart from various types of controllers we saw a novel safety switch which makes it impossible to operate duplicate switches simultaneously. Another item of special interest was an overhead busbar travelling conveyor for feeding portable tools.

Most of the ironclad fuseboards in course of construction incorporate the company's "Scrutact" fuseholder which avoids the disadvantage of springy copper contacts by the use of a screw wedge action operated from an insulated knob expanding the bridge tongue inside a rigid U-shaped fixed contact block. The cartridge is clipped to the tongue of the bridge and its tags are thus forced against the inside of the U contact. The two insulated knobs on the bridge completely clamp together all connections from the busbar to the cable socket. Instead of a few pounds, which is the maximum pressure obtainable with a spring contact, pressures of up to half a ton are obtainable. Among the many other items being made were change-over switches, limit switches, cable accessory sealing boxes for India, push-buttons, and ironclad tumbler switches.

TIME SWITCHES FOR AUSTRALIA

THE Horstmann Gear Co., Ltd., now engaged in supplying 16,200 time switches for the State Electricity Commission of Victoria, Australia, has just received a further contract for 1,000 time switches from the Electricity Trust of South Australia.

Large-scale Production

ONE OF THE WORLD'S LARGEST ELECTRIC COOKER FACTORIES

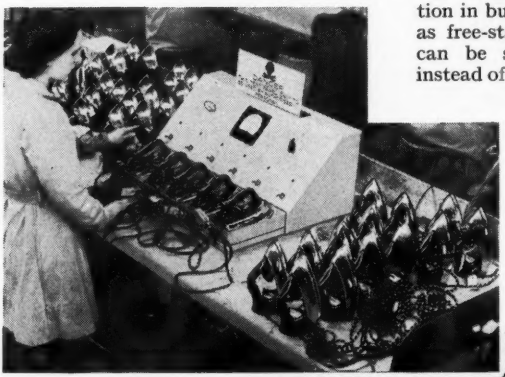
WITH the passing of the sellers' market the adoption of the most up-to-date methods of production is essential if manufacturers are to achieve the maximum output coupled with minimum production costs and a high standard of product enabling them to compete on favourable terms with their rivals at home and abroad.

For over forty years the Revo Electric Co., Ltd., has shown itself receptive of new ideas both in the matter of design of its products and in the adoption of improved production methods. As a result, from the first small production shop erected on a derelict site at Tipton, Staffordshire, there has developed an organization which, now occupying a 60-acre site, is producing in large quantities at competitive prices a wide range of high-quality goods, comprising many kinds of domestic electrical appliances, fans, industrial and street lighting fittings, and metalclad switch- and fuse-gear.

Small section of the cooker assembly department (title); some of the new larger models of the "Princess" cooker are seen in the centre (top right); assembly of cooker control units for Cape Town (above); new "Duchess" cooker for export (right)

The company's manufacture of cookers is especially interesting. The main cooker shop, one of

the largest in the world, is 1,000 ft long. One bay is used as an automatic machine and press shop whilst in another are long sub-assembly lines for making elements, hot-plates, grill boilers, etc. The main assembly line, which is laid out to handle 500 cookers a day, extends practically the whole length of the shop, progressive conveyor systems bringing the units towards their final test, inspection and despatch. In addition, other ancillary assembly lines



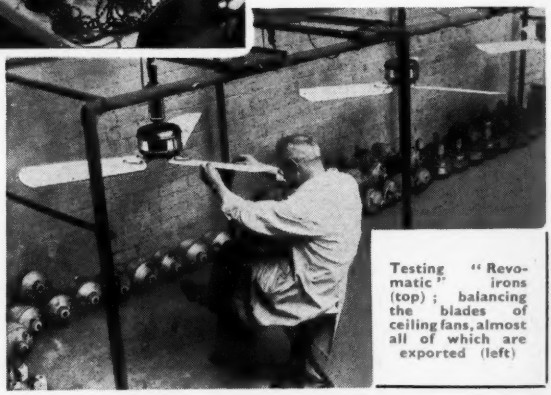
are in use giving a total output of 3,250 cookers per week.

When we visited the factory recently we were shown the first of a new series of cookers designed specially for the export market and incorporating features for which some overseas customers have preference. This "Duchess" cooker has a spring-loaded drop-down oven door and a full width oven with a capacity of 3,500 cu. in. Separate three-heat switches control top and bottom oven elements and hob equipment which may comprise either three or four boiling plates.

Both models can be supplied with a draw-out hot chamber below the oven or, alternatively, with a flush plinth in place of the drawer. The finishes are two-tone ivory or mottled grey vitreous enamel. The cooker is 36 in high, 21 in wide and 18 in deep.

Just coming off the assembly lines, too, was the first batch of a larger version of the attractive "Princess" cooker introduced about a year ago, having a deeper oven and additional hob equipment. The exterior of this range of cookers is absolutely sheer—front, top, sides and back. The vitreous enamelled surfaces are quite flat with rounded corners and edges and there are no projecting hinges or ledges to break the line. This renders the cookers suitable either for incorporation in built-in unit kitchen equipment or as free-standing units. The new models can be supplied with heated drawers instead of the flush plinth bases. Standard finishes are two-tone ivory, cream and green and mottled grey.

Production of some of the original, smaller, "Princess" is now carried out in a new domestic appliance department separate from the main cooker shop. Here also are made the company's various



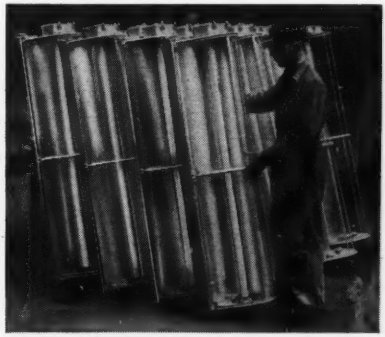
Testing "Revomatic" irons (top); balancing the blades of ceiling fans, almost all of which are exported (left)

table cookers, including the "Dandy" and "Jubilee." The former has been considerably modified since it was first brought out. It now has an enclosed instead of an open plate which is also larger; the hob is vitreous enamelled. The low-priced "Jubilee," sales of which are now nearing a quarter of a million, is heavily lagged and incorporates bottom oven elements besides the grill boiler.

Close by are made the transformers for

Large-scale Production—*continued*

the " Superspeed " boiling plates which are an optional feature of the standard Revo cookers. In the same section the control gear is produced for mercury and fluorescent lighting equipment. All transformers and chokes for service in hot climates are given a special tropical finish. Some idea of the extent of the work of this department can be gained from the fact that over a million laminations a month are used.



Batch of " Sol-etern " fluorescent street lighting units ready for despatch

The remainder of the domestic appliance department is occupied mainly with the manufacture of boiling rings, irons, kettles, hotwater jugs and fires.

Three types of irons are now in production—the " Challenger," the somewhat similar " Portex " (designed especially for export) of exceptionally robust construction and the " Revomatic " streamlined heat-controlled model, with its thermostat preset to its maximum heat.

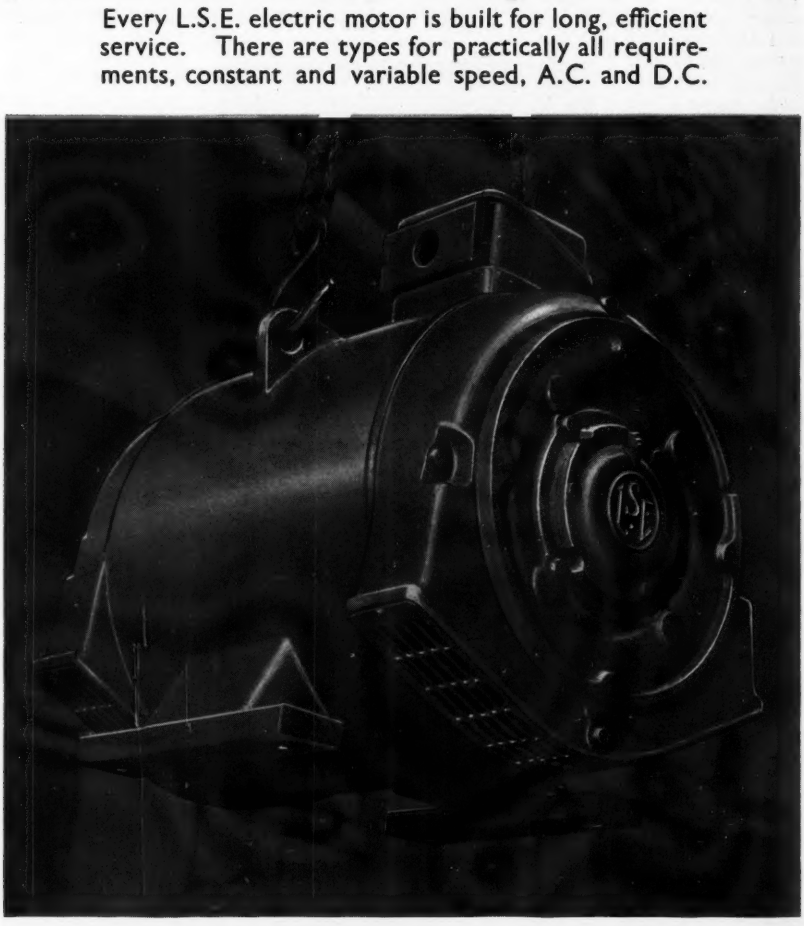
The " Revomatic " kettle has its copper body scientifically shaped to assist rapid boiling and to provide maximum capacity (3½ pints) within minimum dimensions. It cannot be overfilled because of the sloping orifice, which also prevents spilling when pouring. A bimetal thermostat-operated safety mechanism is incorporated. The 3-pint "Electrajug" fitted with an 850-W element is a comparatively new product useful for heating various liquids : it is made of copper, chromium or nickel plated. Water urns are made in three different sizes, 1½, 2 and 2½ gal. Good business is being done abroad in fires, especially in the " Tubula " with its tubular steel frame and adjustable reflector. The company's tubular heaters incorporate mica elements. One further product of this department is electric vulcanizers, comprising aluminium castings, brass liners and thermostatically controlled elements.

Almost all of the company's range of

Flameproof lighting fittings being packed for shipment abroad

AN ENGINEERING JOB

Every L.S.E. electric motor is built for long, efficient service. There are types for practically all requirements, constant and variable speed, A.C. and D.C.



LAURENCE, SCOTT & ELECTROMOTORS LTD.

Electrical Engineers since 1883 · NORWICH, ENGLAND

Large-scale Production—*continued*

ceiling fans, as well as a high proportion of the desk models, are exported. Their construction is notable for its simplicity, the design aiming at giving long service in hot climates without attention and moving a large volume of air at a very low current consumption. Special care is taken in testing the motors and balancing the blades.

Most of the smaller types of industrial and house service switchgear is now made on the conveyor system. Diecast zinc alloy cases are largely employed for many types of unit, though iron is still retained for the heavier equipment. The company's consumers' service units are compact and easily accessible for wiring.

Though we have left it to the last, the industrial and street lighting section of the company's business is one of the most important. It covers every type of fitting for gas-filled and vapour discharge lamps and its products are in service in all parts of the world. One large section of the factory is engaged on the production of Buxton certified flameproof lighting units for use in inflammable atmospheres. A very high proportion of these fittings goes abroad.

Among street lighting fittings one of the most recent developments has been the manufacture of the " Sol-etern " units for accommodating two or four 80 W 5-ft fluorescent lamps, and a smaller fitting, for side road lighting, having two 2 ft lamps of either 20 W or 40 W. Many leading overseas public lighting installations utilize Revo street lighting equipment, some of which are illustrated in an attractive 88 page brochure produced in colours with an introduction in English, French and Spanish.

From the manufacturing standpoint the company is in a highly favourable position owing to its being self-contained. It has large mechanized ferrous and non-ferrous foundries, and an extensive up-to-date vitreous enamelling plant, the latter comprising twelve furnaces (some of which are of the continuous conveyor type) and a section where the enamels are prepared. A woodworking section produces the company's manufacturing requirements and also packing cases for export.

LARGE SHIPMENTS OF ELECTRIC CLOCKS

Alarm Types Popular

DESPITE difficulties with import licences and frequency fluctuations in certain countries, the export of electric clocks from Great Britain is continuing at a high level. Smith's English Clocks, Ltd., Sectric House, Waterloo Road, Cricklewood, London, N.W.2, one of the largest manufacturers, tell us that a substantial proportion of their production is now going abroad, among the largest purchasers being Australia, New Zealand, Canada, Argentina, South Africa, India, Hong Kong and Malaya.

Although there is a good demand for all types the " Autolarm " and " Autocal" 24-hour fully automatic units, which have a special week-end alarm cut-out for people who do not wish to be called during holidays, etc., are especially popular, as are also the company's range of wall clocks. Among the new types just being brought out is an electric chime clock.

A small portion of the clocks awaiting despatch to all parts of the world in the Export Department of Smith's English Clocks, Ltd. About half the units sent abroad are electrically operated

MAGNET WIRES IN EVERY COMBINATION
OF COVERING
STRANDS CORDS AND CABLES

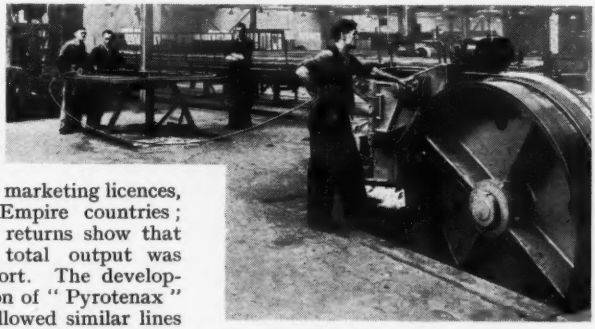
FIBRE GLASS INSULATED CONDUCTORS

LPS
ELECTRICAL CO. LTD.
ALPERTON · WEMBLEY · MIDDX ·
TELEPHONE: PERIVALE 5621-3 · TELEGRAMS: ENGINEYOR PHONE LONDON

Mineral Insulated Cables

GROWING POPULARITY OVERSEAS

AN increasing number of countries are coming to appreciate the advantages of mineral insulated cables, especially for use where there is excessive heat, etc. After the war, Pyrotenax, Ltd., Hebburn-on-Tyne, who make this type of cable, set out to develop their export market in those territories covered by their marketing licences, mainly the British Empire countries; their latest quarterly returns show that 32 per cent of the total output was booked to direct export. The development of the application of "Pyrotenax" cable overseas has followed similar lines to that which took place in Great Britain when the cable was first introduced. South Africa, Australia and New Zealand, in particular, are now using large quantities.



Bull block used for the later stages of drawing

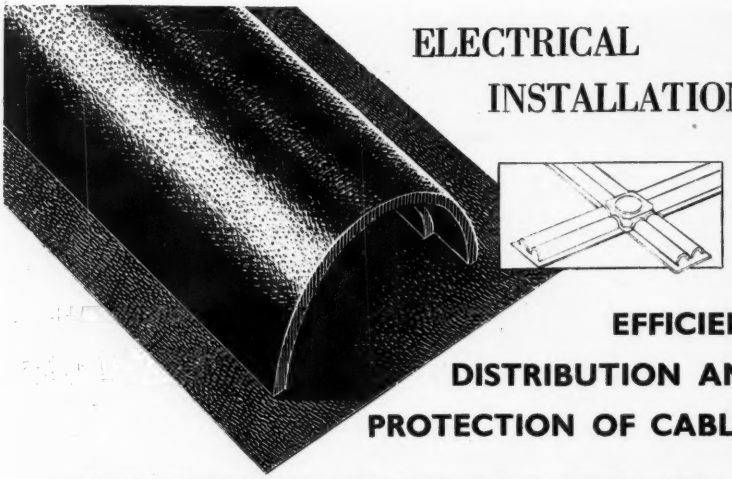
The special feature of the cable is that magnesia is employed as the insulating medium instead of the customary materials. The magnesia in powder form is formed into pellets about 1 in. thick and 2 in. in diameter, with appropriate holes for the conductors. After firing, the pellets are inserted into copper tubes and the conductors threaded through.

A series of drawings through dies interspersed with annealing processes reduces the diameter of the cable and the conductors inside proportionately. About 50 sizes of cable, from 0·0015 sq. in. to 0·2 sq. in. conductor area, are produced from one or two sizes of copper tube.

The cable will withstand very heavy overloading; it can be bent, distorted and hammered flat to the thickness of a sixpence without failure; it can be installed in very hot situations as, for example, in boiler houses; and it is highly resistant to sea water.

A somewhat special technique is required for jointing the cable, but explicit written instructions which are issued enable difficulties to be avoided. All the company's main agents abroad have Pyrotenax-trained men on their staff.

Wire drawing benches and electrically-heated annealing ovens



ELECTRICAL
INSTALLATIONS

EFFICIENT
DISTRIBUTION AND
PROTECTION OF CABLES

KEY FIBRE

UNDERFLOOR DUCT WIRING SYSTEM

In this post-war period of reconstruction and expansion the Key Fibre Duct is playing a major part in the installation of electric cables in office buildings and factory premises with the minimum use of steel conduit. Designed for maximum flexibility, Key Fibre Ducts can be tapped where and when required, enabling all present and future electrical requirements to be provided for. Manufactured from Cellulose Fibres and thoroughly impregnated with Bituminous Pitch, Key Fibre is non-condensing and non-corrodible and is therefore ideal for use in all climates.

Other "KEY" products include :—
KEY FIBRE CONDUIT (for underground cables)
and **KEY ALUMINIUM ALLOY CONDUITS**
in sizes up to B.S. 31, for domestic wiring

★ EXPORT
Agents' names for European, African and Middle East countries will be supplied on application.

THE KEY ENGINEERING COMPANY LTD.

4 QUEEN VICTORIA ST., E.C.4
CABLES: "KEYPOINT," CANNON, LONDON

TRAFFORD PARK, MANCHESTER
"KEYPOINT," MANCHESTER

THE *Charlton* 'TWIN'

DUAL-PURPOSE ELECTRIC WATER HEATER

Provides a complete Hot Water Service from an easily-installed compact unit. It has been designed for installation under the draining board for four reasons: (1) This space, in the modern kitchen, is rarely used efficiently. (2) Gives the shortest pipe run to supply point. (3) Allows simple floor mounting. (4) Unit can be enclosed.

The "Charlton" Twin is the most effective water-heating system for the medium-sized home. Ask for leaflet HD 20 now!

A BNE Product
OF JOHNSON & PHILLIPS LTD

BRITISH NATIONAL ELECTRICS LTD.

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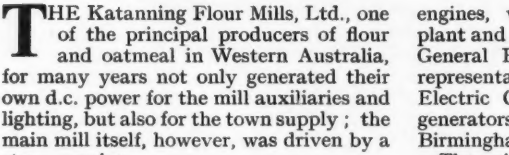
Flour Mill Conversion

GENERATING PLANT FOR WESTERN AUSTRALIA

THE Katanning Flour Mills, Ltd., one of the principal producers of flour and oatmeal in Western Australia, for many years not only generated their own d.c. power for the mill auxiliaries and lighting, but also for the town supply ; the main mill itself, however, was driven by a steam engine.

In 1946, when this steam plant appeared to be nearing the end of its useful life, it was decided to adopt electrical operation throughout the mill.



Two 220-kW 600 r.p.m. G.E.C. diesel-driven d.c. generators

To provide the necessary power, two 220 kW, 240 V d.c. generators, driven at 600 r.p.m., by Crossley Bros. diesel engines, were installed. The electrical plant and switchgear were supplied by the General Electric Co., Ltd., through its representatives, the British General Electric Co., Pty., Ltd., Australia, the generators being built at Witton, Birmingham.

The switchboard was designed and built locally by the British General Electric Co., and embodies G.E.C. instruments, and other components of Australian manufacture, a feature being the heavy currents which have to be handled owing to the low generating voltage.

A new power house of modern design houses the new generating plant and switchgear, as well as two existing smaller diesel sets which are being retained temporarily.

The 150 h.p. motor which has replaced the steam engine is a standard d.c. machine of the protected type, running at 320 r.p.m., controlled by a pillar type starter. Rope drives from this machine operate the three main line shafts of the mill.

British Industries Fair

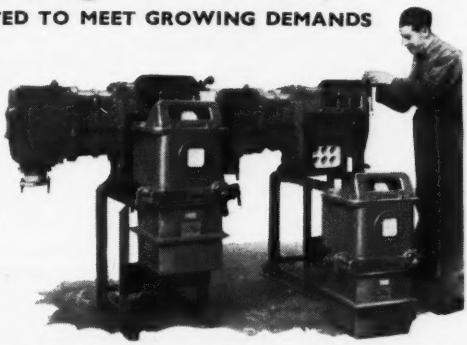
ABOUT 400 of the stands at the Engineering and Hardware Section of the British Industries Fair, which is to be held at Castle Bromwich, Birmingham, from 2nd to 13th May, will contain items of definite electrical interest and most of the others have some electrical bearing. Besides the heavier electrical machinery and equipment there will be comprehensive displays of industrial commercial and domestic appliances, together with installation materials and accessories. A good deal of domestic apparatus will also be found among the 150 or so stands of electrical interest at Olympia and Earls Court, London, where vacuum cleaners, radio and clock sections are situated. Electrical instruments, electro-medical appliances, lighting fittings and plastic products are other electrical products to be shown in London.

ALUMINIUM CASTING ALLOYS

FULL details of the chemical, physical and mechanical properties of a wide range of aluminium alloys for foundry use are contained in a 32-page booklet just published by Renfrew Foundries, Ltd., Hillington, Glasgow, S.W.2. It also includes some technical notes on the design of castings arranged in such a way as to convey useful information in a brief and easily digestible form.

Increasing Switchgear Production

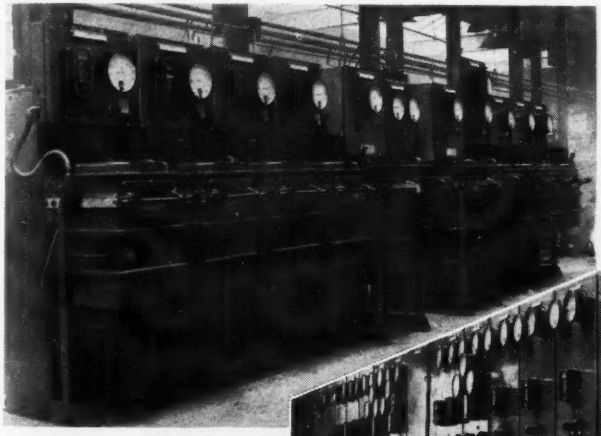
NEW METHODS ADOPTED TO MEET GROWING DEMANDS

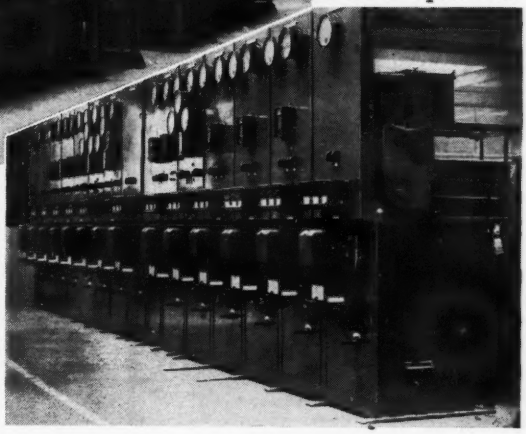


Type "MG" horizontal draw-out flameproof oil circuit breakers suitable for 3·3 kV 25 MVA service completed for South Africa

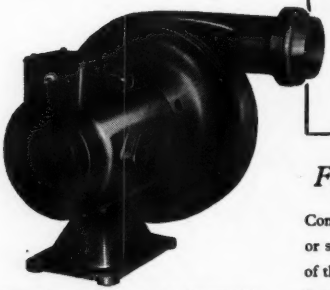
AS well as meeting increased demands for switchgear to equip new generating stations and sub-stations, and also for mine mechanization schemes in the United Kingdom, Switchgear & Cowans, Ltd., Elsinore Road, Old Trafford, Manchester, have also concentrated a large portion of their production capacity to the manufacture of equipment for export. With fifty years of experience in the development, design and manufacture of switchgear, they have an extensive knowledge of the technical requirements for this type of equipment.

New production methods, a well planned machine shop and a modern welding and fabrication department, have all played their part in increasing the output. All components are jig manufactured and a high degree of standardization has been achieved to give maximum interchangeability. This in itself helps considerably to speed up production and as a result it is now possible in a number of cases to reduce the time taken in the actual final assembly to a matter of days as compared with weeks by other methods. It speaks well of the efficiency of the production methods when we say that we have never been in a similar factory which is kept neater.





L.v. industrial switchboard comprising units of 1,500 and 800 A rating for an Indian cloth mill. Right: "FB" switchboard built up from units similar to 350 MVA units for New Zealand



These Units are being used in innumerable industries, and for many purposes, including the following :

Forge blowing : Forced draught for small furnaces, muffles, gas blow pipes : Radio and rectifier valve cooling : Fume extraction : Ventilation : Swarf collection and disposal.

"Statair" Units can be used in conjunction with "Secomak" Spray Gun, Heater Attachment, etc., etc.

Secomak

'STATAIR'
Blowing and Suction Units

For High Velocity Blowing and Suction

Compact, lightweight, easily fitted for use wherever high velocity blowing or suction is required, these units operate at pressures greatly in excess of those to be found in other blowers of twice their size and weight. Air flow can be regulated by means of butterfly valve or variable resistance.

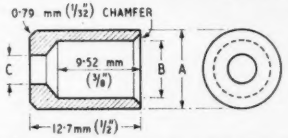
Standard models incorporate combined fan and motor in cast aluminium housing, terminal box tapped ¾ in. conduit, bayonet flanges being provided to inlet and outlet for standard "Secomak" fittings, one protective fan guard and adaptor for attachment of 1¼ in. i.d. hose being supplied with each unit. Alternatively a 2-in. B.S.P. flange can be fitted, enabling any standard pipe fitting to be used for connection.

• *Write for Leaflet No. 104/37E for full particulars.*

SERVICE ELECTRIC CO. LTD., "SECOMAK" WORKS, HONEYPOT LANE, STANMORE, MIDDX.
Telephone : EDGWARE 8631-2-3-4

CABLE END FERRULES

IN BRILLIANT PERMANENT COLOURS



SIZE	A	B	C
1	7·14 mm. (9/32")	4·76 mm. (3/16")	2·38 mm. (3/32")
2	8·73 mm. (11/32")	6·35 mm. (1/4")	3·57 mm. (9/64")
3	10·32 mm. (13/32")	7·94 mm. (5/16")	3·57 mm. (9/64")

STANDARD COLOURS

Red **Blue** **Yellow**
White **Black** **Green**

Supplied either plain or engraved to Customer's requirements.

CRITCHLEY BROS. LTD.
BRIMSCOMBE, STROUD, GLOS.
Phone : Brimscombe 2208

Electrical Equipment
FOR MECHANICAL HANDLING PLANT

CONTACT COLUMNS
LIMIT SWITCHES
LIMITING MECHANISMS

Deco products
include
Contact Collector Columns, Limit Switches, Overhead Collector Equipment, Winch Limiting Mechanisms for Skip Hoists, Cranes and Mechanical Handling Plants, Cable Reeling Drums.

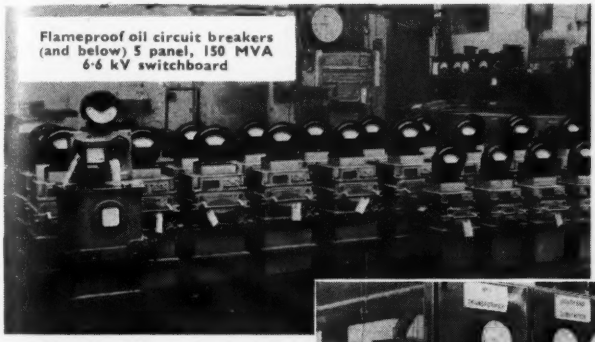
DECO ENGINEERING CO. LTD.
West Row, N. Kensington, London, W.10
Telephone : LADBROKE 3066-7

DI/59

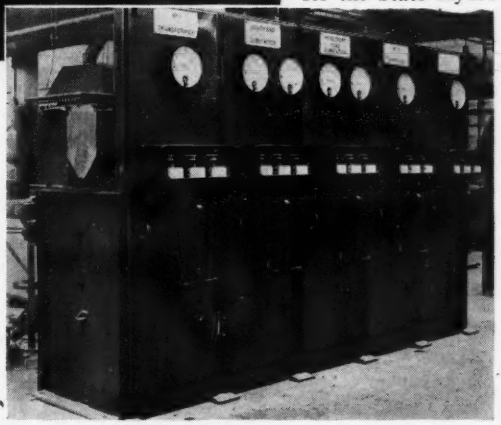
Increasing Switchgear Production—*contd.*

fact we were told that it is only by constant vigilance in keeping the shops tidy and removing components to store as soon as they are completed that it is possible to have the space available to maintain production at its high level.

Among export orders recently completed are 11 kV 150 MVA, 3·3 kV 7 MVA and l.v. switchboards, all for a new cement mill in India. The 11 kV switchboard controls the main supply and the 3·3 kV switchboard controls the heavy quarry equipment. The latter is also arranged for solenoid closing and tripping for operation direct from the quarry. The low-voltage switchboard comprises two 1,500 A incoming circuit breakers and ten outgoing feeders of 400 and 800 A rating. A large number of ring main switchboards, comprising a combination of non-automatic oil switches of the drop-down or non-drop-down pattern with vertical isolation oil circuit breaker units having a range from 75 MVA at 3·3 kV to 250 MVA at 11 kV and 6·6 kV have been supplied for service in many parts of the world. An 11 kV, 150 MVA type "FA" switchboard has recently been despatched to Denmark and another to Whangarei in New Zealand. Flameproof mining type switchgear has been supplied for numerous orders in India and other markets.



Flameproof oil circuit breakers (and below) 5 panel, 150 MVA 6·6 kV switchboard



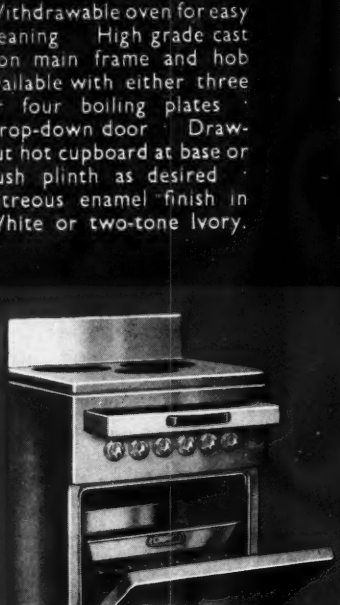
Switchgear & Cowans, Ltd., claim to have been the original manufacturers of induction regulators. The company continues to manufacture these and four 3,000 kVA regulators with control equipment were recently supplied for service in the Middle East; also one 3,125 kVA, two 2,000 kVA and two 1,000 kVA induction regulators complete with the necessary control equipment were despatched to Tanganyika.

The company's h.v. indoor switchgear includes the "FA/FB" range of compound/oil filled, metalclad, vertical isolation units for making and breaking capacities from 75 MVA at 3·3 kV to 350 MVA at 6·6 kV and 11 kV. Switchboards now in hand include a ten-panel and nine-panel duplicate busbar 250 MVA 11 kV switchboard also a 350 MVA 11 kV switchboard, all arranged for solenoid closing, for the State Hydro Electric Department, New Zealand. A large switchboard has also just been completed for a steelworks in South Africa, while another order covers seventy-nine duplicate busbar "FA" units for 250 MVA service at 11 kV, to be built up into multi-panel switchboards for a large municipality in South Africa. Single busbar units of this type are being manu-

Good cooking - Good looking -

Revo "Duchess" Cookers offer all the latest improvements in modern cooker design and the following are a few of the many desirable features :—

Withdrawable oven for easy cleaning · High grade cast iron main frame and hob available with either three or four boiling plates · Drop-down door · Draw-out hot cupboard at base or flush plinth as desired · Vitreous enamel finish in White or two-tone Ivory.



Revo

"DUCHESS"

ELECTRIC COOKERS

REVO ELECTRIC CO. LTD. TIPTON, STAFFS, ENGLAND

AGENTS IN ALMOST EVERY COUNTRY IN THE WORLD

Increasing Switchgear Production—*contd.*

factured for India and South Africa.

Switchboards now being made of the "UA" type, the air-insulated counterpart of the "FA" unit and having making and breaking capacities from 75 MVA at 3·3 kV to 250 MVA at 6·6 and 11 kV, include a six-panel switchboard and several other switchboards for South Africa and approximately forty units for Government Departments in India. One order includes the h.v. and l.v. switchgear for a new Fuel Research Institute at Dhanbad, India. Another switchboard nearing completion is for the State Railways Department, New Zealand, and another is for Trinidad.

All the circuit breakers included in the h.v. switchgear mentioned can be supplied separately for replacing obsolete circuit breakers for inside kiosks and cubicles, etc. Many of these are now being manufactured for use in Canada and South Africa. Some of these circuit breakers are being supplied with floor mounting framework and a number are arranged for solenoid operation. Low-voltage switchboards, which include units having current ratings of 3,000 A, 2,000 A, 1,500 A, 1,000 A, 800 A and 400 A, are being manufactured for Portugal, the Middle East, South Africa, New Zealand and India.

Within the past few years the company, which was a pioneer in the manufacture of flameproof switchgear, has re-designed the whole of its mining equipment to comply with the latest draft British Mining Regulations and Recommendations. A batch of this new equipment recently despatched to South Africa includes various different types. Type "MG" horizontal draw-out, flameproof, oil circuit breaker units, suitable for l.v. and 3·3 kV service, is supplied for current ratings of 200 and 400 A but has actually been A.S.T.A. certified for 25 MVA at 3·3 kV. Features of this unit include integral isolation and earthing inside the flameproof enclosure, earth leakage protection, pre-compounded busbars with air-spaced link boxes between the units to facilitate the re-arrangement of a switchboard on site, ammeters and voltmeters incorporated in a flameproof enclosure. Also available is a 2 kVA air-insulated lighting transformer which can be mounted on the end of the unit or in the busbar run of a multi-panel switchboard.

One of a group of ring main switchboards being erected for South Africa. Each comprises two type "ID" drop-down pattern, non-automatic oil switches and two type "UA" air insulated, vertical isolation units for use on a 6·6 kV, 3 phase, 50 cycle supply and having a making and breaking capacity of 150 MVA

Several of type "MF" 200 A flameproof air-break circuit breakers arranged for use as single units or for coupling together as a multi-panel switchboard, have also gone to South Africa. One feature of this type of unit is that the circuit breaker portion is built on a withdrawable chassis to provide easy access for routine inspection, and in exceptional circumstances the circuit breaker can be replaced by another portion at the coal face without the necessity for transporting the whole unit to the surface.

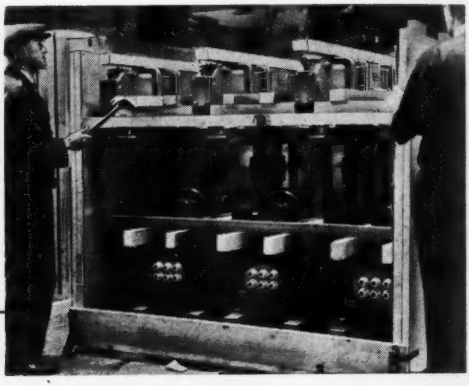
Bolted detachable cable couplers of 200 A rating supplied comprise three major assemblies, namely, the end box (half cable coupler), tee-junction box and straight adaptor. Two end boxes can be coupled together to form a straight-through

Increasing Switchgear Production—*contd.*

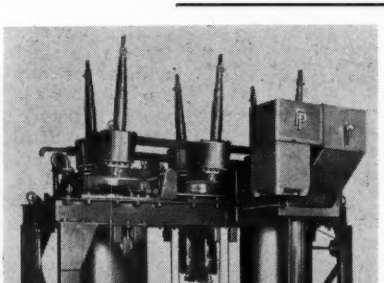
cable box or a number of end boxes and tee-junction boxes can be used to make up multi-point junctions. The advantage of this type of cable box is that standard lengths of cable can be cut and made off with an end box at each end. These can then be taken down the pit and additional lengths of cable inserted to allow the electrical plant to follow up the receding coal face. By utilizing the straight adaptor it is possible to couple the end box to coal face electrical apparatus. By compound filling the cable boxes, they can be used on system voltages up to 3·3 kV. Also in hand for various parts of the world is a quantity of non-flameproof equipment for use in non-fiery mines and h.v. switchboards for surface installations.

During the war an outdoor ring main unit, comprising two oil immersed isolators of 400 A rating and a tee-off switchfuse unit, was developed for the inexpensive control of a tee-off circuit and is still being manufactured. It is suitable for voltages of 3·3, 6·6 and 11 kV, where the through fault current does not exceed 13·2 kA, and several have recently been supplied for overseas service with two tee-off circuits. Another interesting unit is a modification of a 3·3 kV horizontal draw-out circuit breaker of 400 A rating, making it suitable for outdoor service. Some of these units have recently been despatched to Mexico.

In addition to the contract work mentioned, the company is actively pursuing its research work with a view to further improving its products for overseas service. Special attention is being given to meeting tropical conditions. The company now has an apprenticeship training scheme and a number of overseas apprentices are receiving training in the works.



Flameproof horizontal draw-out circuit breakers being packed for shipment to the Tata Iron & Steel Co., India

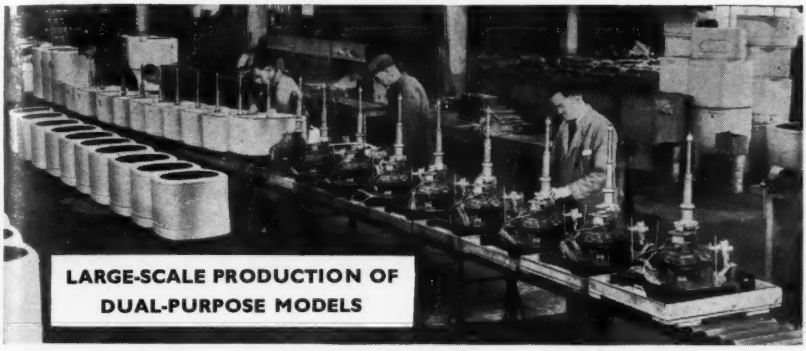


CIRCUIT BREAKERS FOR SOUTH AFRICA

AN order from the Electricity Supply Commission of South Africa for seventy-seven type RP.28/3 indoor circuit breakers for service on the Rand is now nearing completion in the works of Ferguson, Pailin, Ltd., at Higher Openshaw, Manchester. They are rated at 1,000 MVA for 40 kV service with an insulation level of 66 kV. Suitable for mounting in masonry cells, the breaker is of the three-tank design, solenoid operated with current transformers mounted over the terminal bushings. Tank lifting facilities are incorporated within the breaker framework.

One of seventy-seven 40 kV 1,000 MVA circuit-breakers being supplied to South Africa by Ferguson, Pailin, Ltd.

Washing Machines for Overseas

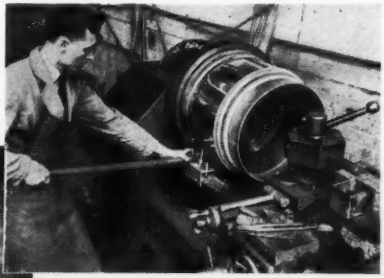


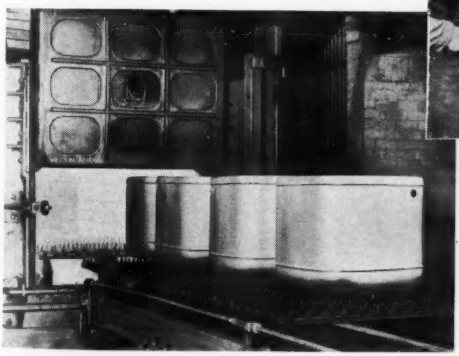
LARGE-SCALE PRODUCTION OF DUAL-PURPOSE MODELS

A GREAT demand has developed abroad for both clothes-washing and dish-washing machines. At Yate, near Bristol, the Thor "Automagic" combination clothes and dish-washing machines are now being produced on a large scale. Two-thirds of those manufactured each month are now going overseas, nearly 40 countries in all parts of the world having placed orders.

The rotating drum or basket which holds the clothes is made in three sections, seam welded together and vitreous enamelled. An up-to-date vitreous enamelling plant just installed comprises degreasing tanks, dipping tank for the ground coat, spraying booths for the top coat, drying compartments and batch type enamelling ovens. The dish-washing drum is spun into shape on a lathe, an aluminium wire being inserted in the top for strengthening.

In the sub-assembly section the motors are inspected and wired to their terminals and the gearing and friction clutch mechanisms are assembled. These permit three distinct operations: (*a*) The backward and forward movement of the agitator, at a rate of 50 reversals a minute, for clothes washing; (*b*) the rotation of the basket at 600 r.p.m. for spin drying; and (*c*) the scooping up and distribution of the water when dish washing.





Spinning the dish-washer drum and (left) tubs leaving the vitreous enamelling oven

Another Load of Lightness

The immense saving in weight, easier handling, fewer fixing points, increased rigidity and greatly superior tensile strength, are all features of J. & P. Aluminum Sheathed Power Cables which engineers have been quick to appreciate. Production is in full swing and we are doing our utmost to cope with a large order book.

J.&P.

ALUMINIUM SEAMLESS SHEATHED

POWER CABLES ☆ ☆

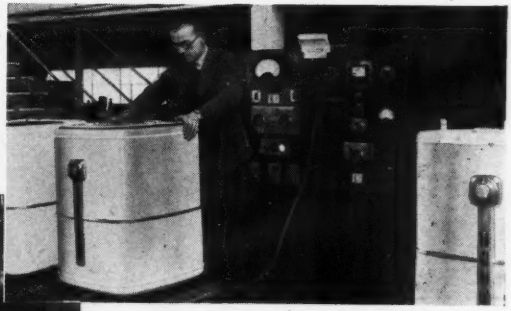
. . . a turning point in Cable Engineering

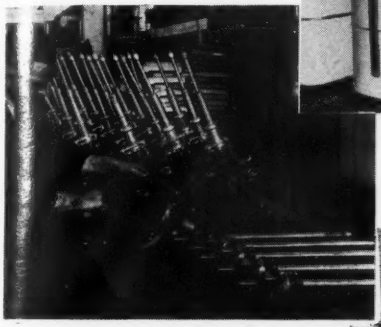
An advertisement of JOHNSON & PHILLIPS, LTD., Charlton, London, England

Washing Machines—*continued*

The ¼-h.p. BTH motor drives through link belting, worm and eccentric gears.

Joining the suspension assembly on the main conveyor line, the mechanisms are bolted down and the four





Testing completed machines under operating conditions (above); assembling the mechanisms (left); and export despatch department below)

frame posts and motor housing are fitted. The switch is mounted with a cover to protect it from water. The pump for emptying the tub is then added. After being filled with oil the units are run for 15 minutes. The skirt, tub and an ingenious balancer device which automatically neutralizes any tendency to vibrate are then attached, together with a Bowden control for the clutch mechanism and also the hoses. The machines are then filled with water and inspected, first for mechanical faults and finally for electrical insulation, consumption, etc. The exteriors of machines are finished in white with black base and thin chromium bands round top and centre sections, which are fabricated from sheet metal.

Special packing methods are adopted when the machines are destined for overseas. The mechanism is bolted to the base through metal spacer pieces in order to take the weight off the suspension straps. The hose, wrapped round the outside of the basket, serves as a bumper between the basket and the tub. Inside its packing case each unit is packed in waterproof paper.

The makers of the machines are Thor Appliances, Ltd., 55-59 Oxford Street, London, W.1.

PLANT FOR VENEZUELAN OIL WELLS

AN interesting order just received by the Marine Division of Associated British Oil Engines, Ltd., is for four Mirrlees "TV12" 12-cylinder vee-form engines developing 910 b.h.p. at 650 r.p.m. for direct coupling to 450 kW d.c. generators, two Mirrlees "TLB7" 7-cylinder vertical engines rated at 367 b.h.p. at 600 r.p.m. for direct coupling to 120 kW 60 cycle alternators and 30 kW d.c. generators in tandem and one McLaren "MR5" 5-cylinder engine rated at 83 b.h.p. at 750 r.p.m. driving an air compressor. This machinery has been ordered by the Metropolitan Vickers Electrical Co., Ltd., for installation on a barge for operating oil-feed drilling equipment in Venezuela. Two 150 kW diesel electric auxiliary sets have also been ordered for a Norwegian ship.

AVO

REGD. TRADE MARK

Precision

ELECTRICAL TESTING INSTRUMENTS

The "AVO" HEAVY-DUTY METER

A multi-range A.C./D.C. electrical measuring instrument of specially robust construction designed for outdoor work and where conditions of rough usage exist. The instrument is housed in a strong metal case and the movement has been designed to withstand severe shock without damage.

It is a moving-coil meter and has a knife-edge pointer and a parallax mirror to facilitate accurate reading. The 3½-inch scale is very open and clear, and the meter is accurate to B.S.I. first-grade limits. Current consumption is 1mA. at full scale deflection on D.C. volts and 2mA. on A.C. volts.

The following ranges of readings are available from one pair of terminals, the range selection being effected by means of a single rotary switch :—

D.C. VOLTAGE :	500, 250, 25, 10v.
D.C. CURRENT :	10A, 1A, 100mA, 10mA.
A.C. VOLTAGE :	500, 250, 25, 10v.
A.C. CURRENT :	10A, 1A, 100mA, 10mA.
RESISTANCE :	0-500 ohms. (Midscale 12.5 ohms)
	0-50,000 ohms. (Midscale 1,250 ohms)

Further ranges can be provided by means of extension transformers for A.C. Current, shunts for D.C. Current, multipliers for A.C. and D.C. Voltage, and Resistance Range Extension Units.

Leather Carrying Case available if required.

Size 7¼ × 5¼ × 4 inches
Nett Weight, 5lbs. 1oz.

Supplied complete with specially designed leads and interchangeable test prods and clips.

Sole Proprietors and Manufacturers:

The AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO. LTD.
WINDER HOUSE • DOUGLAS STREET • LONDON • S.W.1 *Telephone: VICTORIA 3404/9*

H.D.1

Winding Plant by G.E.C.

G.E.C. Winding Plant is installed in all parts of the world. The 1200 h.p. direct coupled, D.C. winding equipment shown above is installed at Brookhouse Colliery, Yorkshire.

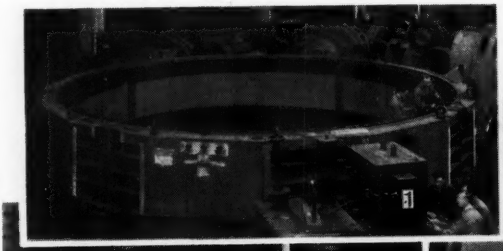
THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Electrical Machinery

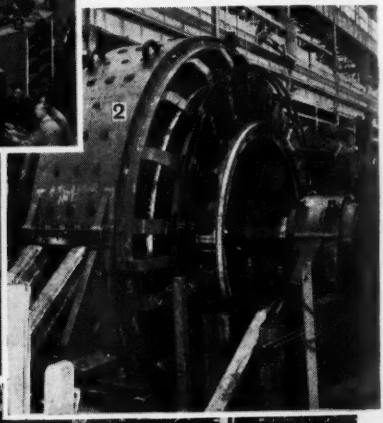
IMPORTANT ORDERS NEARING COMPLETION AT TRAFFORD PARK

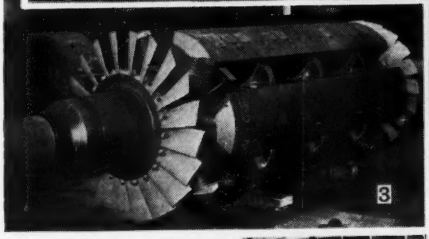
SEVERAL important contracts for large electrical machines are now nearing completion at the Trafford Park works of the Metropolitan-Vickers Electrical Co., Ltd. Amongst the turbo-generators are two 55,555 kVA, 33 kV, 3,000 r.p.m. machines for the Pyrmont generating station in Sydney, Australia, three 15,625 kVA, 11 kV, 3,000 r.p.m. generators for Godavari in Hyderabad, India, an 18,750 kVA, 11 kV, 3,000 r.p.m. generator for the N'changa Mines of the Anglo-American Corporation, South Africa, and two 6,250 kVA, 11 kV, 3,000 r.p.m. generators for Umtali, Southern Rhodesia. Recently tw 31,250 kVA, 22 kV, 3,000 r.p.m. gene ators were despatched to Sout Fremantle in Australia.

There are several large synchronou condensers under construction, a notabl one being a 30,000 kVA, 11 kV, 1,00 r.p.m. machine for Spain, and there is a still larger one on order, a 40,000 kVA 22 kV, 1,000 r.p.m. synchronous condense



(1) One of three 18,000 kVA, 75 r.p.m. water turbine generators for Tainionkoski power station, Finland, under construction

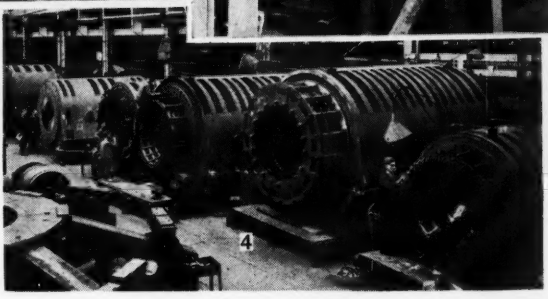




(2) A 3,100 b.h.p., 720 V, 72 r.p.m. d.c. winder motor for the Anglo-American Corporation, South Africa

(3) Rotor of a 30,000 kVA, 1,000 r.p.m. synchronous condenser for Spain

(4) Large machines in course of winding include a 15,625 kVA turbo-generator for Godavari, India; 55,555 kVA turbo-generator for Pyrmont, Sydney; and a 15,000 kVA synchronous condenser for Spain



Water turbine driven a.c. generators are represented by three 18,000 kVA, 75 r.p.m. vertical generators for Tainionkoski power station in Finland, and two

Fine performance, fine finish, fine quality. The Premier Eight - O - Eight Automatic heat - controlled iron is the essence of streamlined efficiency. The finest iron of its kind on the market to-day.

Fine-Quality

Made from the finest materials, finished in heavy nickel plate, the Premier Toaster combines elegant appearance with substantial construction. Two slices of bread can be toasted at the same time and turned without handling.

The Premier "Parabeau" Fire incorporates two "Premier" rod elements, controlled by a switch which enables one or two heaters to be used, as desired. A charming model which will add grace to any room of the house.

The Premier Coffee Percolator, made of strong gauge solid copper, finished in heavy chromium plate, is equal to the best grade of Sheffield Plate. A fine quality percolator which, true to the Premier tradition, will give years of good service.

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3228A

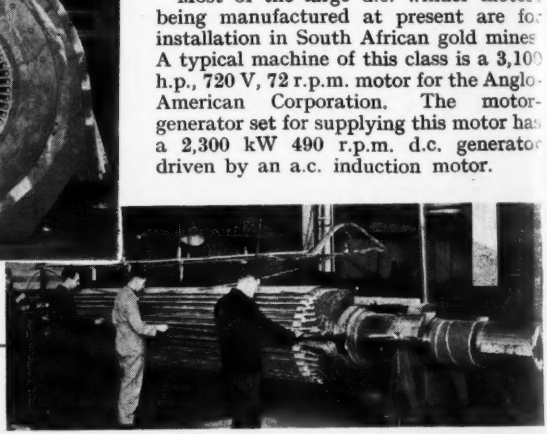
Electrical Machinery—*continued*

19,000 kVA, 500 r.p.m. vertical generators for the Billiton Co. in the Netherlands East Indies. One of the Tainionkoski machines is already on site, and erection

Stator and rotor of a 55,555 kVA, 33 kV, 3,000 r.p.m. turbo-generator for Pyrmont, Sydney

will soon be completed. These water turbine-driven generators for Finland are of extremely large diameter (about 36 ft) on account of the low speed, and actually the largest so far made in this country. They are slightly larger in dimensions than the 33,333 kVA generators supplied by the company to the State Hydro-Electric Board of New Zealand, and recently put into commission at Karapiro generating station. The Karapiro generators are the largest in output as yet completed in the United Kingdom, but recently the company received an order from Norway for two 35,000 kV.. horizontal generators for installation at the Aura power station.

Most of the large d.c. winder motors being manufactured at present are for installation in South African gold mines. A typical machine of this class is a 3,100 h.p., 720 V, 72 r.p.m. motor for the Anglo-American Corporation. The motor-generator set for supplying this motor has a 2,300 kW 490 r.p.m. d.c. generator driven by an a.c. induction motor.



D.c. machines of a different type are the four 370/420 h.p., 480/500 V, 250/260 r.p.m. main propulsion motors for two diesel-electric ferry boats for Hong Kong. The ferry boats are twin screw vessels, each having two propulsion motors.

British Industries Fair

AN especially large number of new electrical developments is to be seen at the British Industries Fair, which is being held at Castle Bromwich, Birmingham, and Olympia and Earls Court, London, from 2nd to 13th May. Although this applies to all classes of apparatus, innovations are perhaps most conspicuous among domestic appliances. One versatile unit to be shown by H. Fisher (Oldham), Ltd., is an "electric housemaid" which can peel potatoes, scour pots and pans, clean shoes, polish buttons, mince meat, grind coffee, whisk eggs, stir puddings, etc. Among several cookers brought out to meet the demand of overseas buyers is the new Revo "Duchess" model, which has an extra large oven (3,500 cu. in.) with top and bottom elements separately controlled.

Probably the largest single piece of electrical equipment ever shown at the Fair is a 275-kVA oil-break circuit breaker, made by the British Thomson-Houston Co., Ltd. It weighs over 10 tons, stands over 23 ft high to the top of its insulators and has an oil tank over 10 ft in diameter and 6 ft in depth. Representing an actual unit now being built at the B.T.H. Rugby works is a model of a 1,200-h.p. gas turbine alternator.

One of the many proposed new applications of high-frequency heating is grass drying, an experimental equipment for which will be demonstrated by E.M.I. Factories, Ltd.

A remarkable production aid, which can be operated by unskilled labour, is the Ega Electric "automatic brain" which searches domestic electrical appliances, switchgear, etc., for faults.

SURVEY OF EXHIBITS

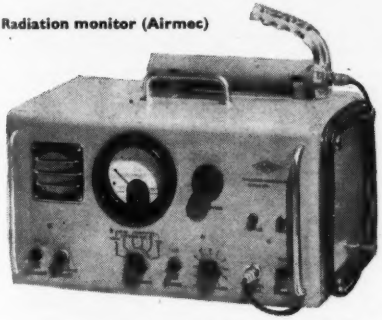
Space permits only the briefest reference to the principal exhibits. We shall be pleased to obtain fuller particulars of any items in which readers may be interested.

Advance Components, Ltd.—A constant voltage supply unit primarily intended for the operation of pH meters or other instruments requiring a 12-V d.c. supply. It is light in weight and comprises a constant voltage transformer followed by a selenium metal rectifier. Various types of constant voltage transformers are also shown with outputs ranging from 4 W to 3 kW.

A.E.W., Ltd.—Rectangular chamber electric furnaces of improved design in sizes of from 6 in long by 6 in wide by 2 in high to 48 in long by 24 in wide by 20 in high, with temperature ranges up to 1,200 deg C. A small vertical electric crucible furnace is intended or making melts of a few ounces and is therefore suitable for laboratory and dental work, etc.

Airmec Laboratories, Ltd.—An instrument for detecting alpha and beta particles and gamma rays, suitable probes being provided for each application. The probe is connected to the instrument by a flexible lead, a moving coil meter providing direct readings of intensity and a loudspeaker audible indication of activity. The apparatus is portable and works from normal mains supplies. An ionization voltage tester facilitating the determination of the threshold voltage at which ionization occurs is also shown. It is believed that this is the first practical instrument of its kind for general use.

Radiation monitor (Airmec)



Automatic Coil Winder & Electrical Equipment Co.—Test equipment mainly for the radio industry including a portable multi-range instrument with a basic sensitivity of 50 μA full scale, and a resistance of 20,000 ohms/volt on the d.c. ranges, a heavy duty meter for testing railway track signalling circuits, a valve characteristic meter and valve voltmeters.

Baird & Tatlock (London), Ltd.—A feature of Mullard-B.T.L. potentiometric titration apparatus is the incorporation of a cathode-ray indicator in place of a galvanometer. The "magic-eye" enables the point of balance to be found more rapidly and also, by suitable adjustment, it is possible to make the closing of the "eye" coincide with the end-point of the titration.

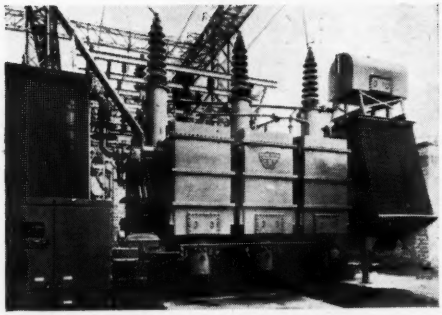
Bakelite, Ltd.—The extent to which "Bakelite" plastics in their various forms can be applied to the manufacture of scientific instruments is brought out by a range of complex mouldings displayed together with components machined from laminated plastics, including slide rules and scales. The use of "Vinylite" resins for protecting metallic and glass components during transit is explained by other exhibits.

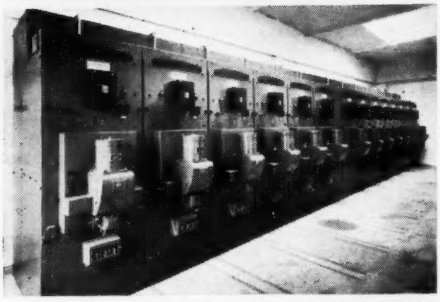
Baldwin Instrument Co., Ltd.—An ionization chamber X-ray dose and dose-rate meter of substandard accuracy. The ionization chamber is connected to the instrument by a flexible screened cable and the sensitivity of the whole is such that a wide range of radiation intensity can be measured. The ranges are 0-30, 0-100, 0-300 and 0-1,000 roentgens or roentgens per minute. Corrections for ambient temperature and pressure can be preset.

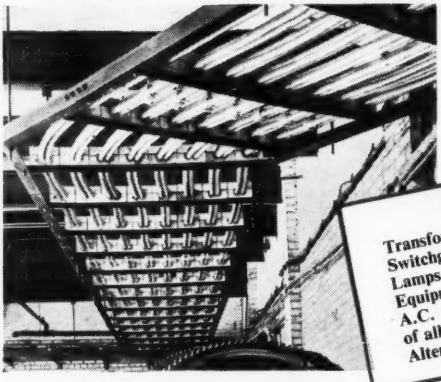
British Electric Resistance Co., Ltd.—For use in conjunction with electronic equipments a three-phase automatic voltage stabilizer which provides a voltage constant to within 1 per cent from a supply that may vary by as much as 10 per cent. Single-phase regulators of this kind are also shown together with sealed rotary rheostats and potentiometers for use under arduous conditions of humidity and corrosion.

British Rototherm Co., Ltd.—An automatic thermostatically controlled low-temperature bath designed to cover a range of temperatures between ambient and approximately −75 deg C. It consists of a tank and circulatory system controlled automatically or manually to by-pass quantities of the circulating liquid over a block of carbon dioxide. It embodies electronic control and the differential of the tank may be adjusted.

British Thermostat Co., Ltd.—"Teddington" resistance strain gauges consisting of very







Make it a Combined Operation

In the hands of Crompton Parkinson Ltd., the whole of a power supply project is under one control. This famous pioneer Company not only manufactures all the plant required—transformers, switchgear and cables, but also offers a complete engineering service for its application and installation.

PRODUCTS INCLUDE :—

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Instruments
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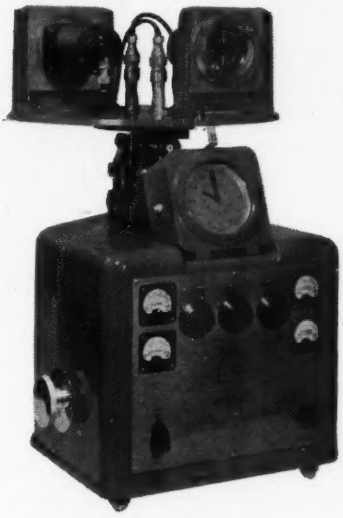
ine wire in close zigzag form laid between heets of tissue paper, the whole being bonded vith an insulating medium. A feature of these auges is that they are prepared for quick nd positive adhesion. They are available n single or multiple forms with lengths varyng between 0·062 in and 2·0 in and reistance values between 50 and 2,500 ohms.

Bryans Aeroquipment, Ltd.—A roll, pitch nd yaw table, developed to accommodate ll types of electrically-driven gyroscopic nstruments. A ½-h.p. synchronous motor riving an infinitely variable system of gears



Roll, pitch and yaw table (Bryans Aeroquipment)

provides speed control for the table top. Speeds remain constant over a range from 0·1 to 6·0 r.p.m. The table also rotates in azimuth and can be set to automatically change rotation once every minute. The equipment embodies a synchronous timing clock and the table is marked in degrees, thus enabling rotational checks to be made with extreme accuracy.

Cambridge Instruments Co., Ltd.—A complete range of galvanometers and electrometers covering almost the entire field of electrical measurements, comprising those with short or long periods, ballistic patterns, high or low frequency, astatic and electrostatic patterns, and instruments embodied in electronic circuits. They include both reflecting and pointer types together with those employing large illuminated scales for lecture and class work.

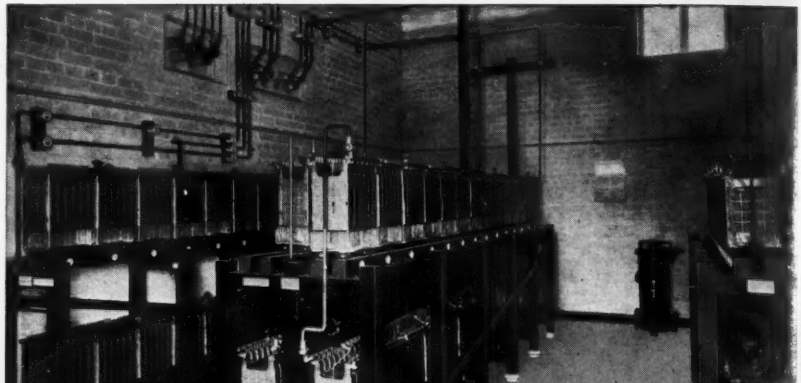
Cinema Television, Ltd.—Apart from multipurpose and educational oscillographic equipment a device is shown which facilitates the display of two separate waveforms on any standard single beam oscilioscope. Two traces are produced by means of an electronic switch, each being used to display the signals which are applied to one of the separate signal channels of the switching unit.

Double beam oscillograph (Cossor)

A. C. Cossor, Ltd.—An easily portable oscillograph designed as a general purpose instrument and comprising a double beam tube unit, Y-deflection amplifier and internal power supplies. It is arranged for operation on mains voltages ranging from 105 V to 225 V at frequencies between 50 c/s and 100 c/s and is rated at 48 W. Another model will shortly be available for mains frequencies of from 25 c/s to 1,700 c/s.

Dawe Instruments, Ltd.—Audio frequency measuring apparatus for recording response

High speed audio frequency recorder (Dawe)



Ediswan Stationary Batteries are proving their unfailing reliability under all conditions in over fifty sub-stations of the grid system of Great Britain, as well as in cinemas, theatres, hospitals, factories and public buildings.

Above is shown a recent installation for switch closing and emergency lighting, consisting of fifty-five Ediswan stationary cells, type BBH 5 with a voltage of 110 and a capacity of 250 ampere hours.

The services of our Technical Branch are available, without obligation, to offer expert advice and co-operate in the planning and installation of emergency lighting. New applications are constantly being called for and we will be pleased to plan any particular or specialised requirement.

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characteristics on linear or logarithmic scales. It is suited for automatically recording rapid signal level variations over a wide range for such applications as microphone, amplifier and loudspeaker frequency characteristics. A feature of the apparatus is the rapid writing speed, amounting to 600 db/s without any overshooting effect.

Crompton Parkinson, Ltd.—Instruments for educational institutions including moving coil "Universal Indicators," galvanometers, ammeters, milliammeters, microammeters, voltmeters and millivoltmeters are housed in various casings with scale lengths of from 2½ in to 18 in.

De Havilland Propellers, Ltd.—Amongst equipment for the examination of vibration and associated problems is a self-contained six-channel bridge for use with strain gauges to measure the steady strain at six points in rapid succession. It has the advantage of providing direct readings of the percentage resistance change taking place, thus enabling the strain to be readily determined.

Dynatron Radio, Ltd.—Self-contained rack mounting monitor oscilloscope with d.c. coupled Y amplifiers and cathode follower probe for monitoring in discriminator circuits, etc. The amplifier frequency response is ±1 db up to 1 Mc/s and less than 3 db down at 3 Mc/s; the probing capacity is less than 20 pF. The time base may be self-running (50 c/s to 50 kc/s) or triggered from external positive or negative pulses (sweep speeds 15 microseconds to 30 milliseconds).

Edison Swan Electric Co., Ltd.—A low frequency oscillator intended as a means of setting up and maintaining low frequency analysing equipment. Its range is subdivided into seven sections, the total coverage being 1·4 c/s to 5,500 c/s. Another instrument, designed primarily for therapeutic purposes, incorporates automatic electronic surging

Low frequency oscillator (Edison Swan)

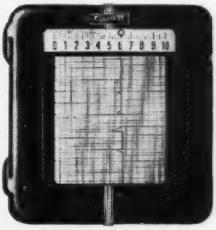
with variable characteristics to provide for different treatments.

W. Edwards & Co. (London), Ltd.—Small vacuum coating plants for research, educational and industrial uses, together with a selection of vacuum equipment accessories.

A portable valve-operated microammeter is also exhibited containing a highly stable d.c. amplifier for the measurement of low ionization currents.

Electro Methods, Ltd. — A magnetic amplifier relay which causes a robust relay to operate and release from a small input, and which discriminates according to the polarity of the latter. The incoming signal is connected to a magnetic amplifier, which is fed from the normal a.c. mains and the output of which operates an electromagnetic relay.

Electronic Instruments, Ltd. — The "Minerva" smoke detector, which incorporates a sensitive "nose" actuating an alarm when the concentration of smoke reaches a predetermined value. The nose contains an ionization chamber which is open to the atmosphere. A source of radium maintains the air within the chamber in an ionized condition and a potential applied across the chamber causes a small current to flow. Smoke particles entering the chamber produce a variation in current, which is used to actuate a cold cathode tube.



Potentiometer recorder (Elliott)

Elliott Brothers (London), Ltd.—A potentiometer recorder in which the d.c. out-of-balance signal is converted to a.c. by means of a magnetic invertor of novel principle, self-contained automatic standardization being provided. The effective chart width is 10 in across which the carriage will travel in the minimum time of 12 seconds. A combined valve and magnetic amplifier servo system using magslip information provides the angular sum of the position of several remote shafts and illustrates the use of magnetic amplifiers coupling thermionic valves and higher power devices, reducing h.t. consumption by a factor of 5.

Erie Resistor, Ltd.—Apart from a wide range of resistors and capacitors designed for special purposes in the radio industry, the exhibits include a complete line of suppressors for use in eliminating radio interference caused by motor-car ignition.

Evans Electroselenium, Ltd. — Amongst photoelectric instruments the "Eel" screen brightness meter has been developed to

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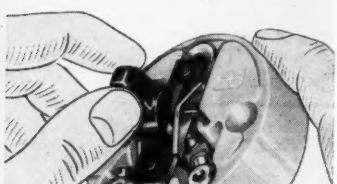
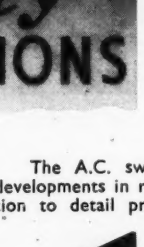


B66 range

SA 66/2 Range



SA 66 Range

C66 Range

The A.C. switch range which includes the latest developments in research combined with TUCKER devotion to detail producing switches of outstanding performance and refined appearance.

The arc-eliminating mechanism incorporates conical type contacts giving maximum contact area.

All Tucker switches embody vitreous porcelain bases, unsurpassed for insulating qualities.

Surface type (B.66 range) with 2" (51 mm) base, 1-way and 2-way.

Flush type (SA66 range) for mounting in boxes with lugs at 3·281" (83 mm) centres. In various combinations of one-way and two-way types.

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investigate problems connected with the reflectivity of cinema screens. The relative position to obtain correct measurement in each cinema is found by locating the screen visually in a viewfinder fitted to the meter. It is direct reading in foot lamberts.

Everett, Edgcumbe & Co., Ltd.—Designed for laboratory or industrial use, a combined electronic and "Synclock" long scale process timer will operate a contact after a preset time, or provide a d.c. pulse of controllable amplitude from one millisecond upwards. An additional feature is the facility for remote starting by means of an external circuit.

Evershed & Vignoles, Ltd.—Apart from improved "Megger" insulation, continuity and earthing testers, an electro-pneumatic positioner relay is shown which receives a signal current from a remotely situated controlling transmitter and accurately positions an air-operated valve in accordance with the value of this current.

Ferranti, Ltd.—A magnetic amplifier developed in collaboration with the Ministry of Supply is shown comprising a very sensitive d.c. valve amplifier in which the input modulates a 1,500 c/s carrier wave by means of a magnetic modulator. The error depends principally on the symmetry of the magnetization characteristic of the transductors and the noise in the modulating stage; these are below the input level of 10^{-17}W. The arrangement delivers an output of 10 V across a 10 kΩ resistor for an input of 10^{-16}W and the gain can be adjusted by means of a feedback control. The time constant is about 0·02 second, and can be improved by increasing the feed-back at the expense of gain.

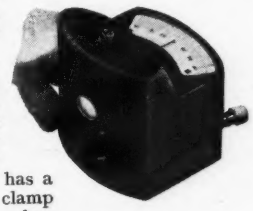
Foster Instruments Co., Ltd.—Automatic indicating temperature controller for continuous operation in conjunction with electric furnaces. A light metallic vane fixed to the pointer of the temperature indicator and a fixed vane attached to the control arms form a variable capacitor which is part of an oscillating circuit. It is so arranged that the amplitude of oscillation, and hence the anodecurrent of the oscillator valve, varies as the capacitance between the vanes changes. The change in anode current, first applied to a trigger circuit, operates a relay which in turn controls the furnace input.

Furzehill Laboratories, Ltd.—Designed for low and audio frequency work an oscilloscope has the high sensitivity of 1 mV r.m.s./cm. over the range from zero frequency to 50 kc/s. An input attenuator with a range of 10,000 : 1 permits signals of up to 80 V to be handled.

A. Gallenkamp & Co., Ltd.—Thermostat baths; one designed to operate at temperatures approaching 100 deg C with a differential of ±0·01 deg C for use with U-tube or suspended level viscometers and the other for general laboratory use to operate up to 40 deg C above ambient with an accuracy of control to within ±0·05 deg C. Also a range of heat control boxes for permanent or temporary installation.

Gambrell Bros. & Co., Ltd.—Robust and accurate instruments for educational purposes, attenuators, a standard high resistance of 50 megohms, a fully guarded oil testing condenser with provision for vacuum drying and a low voltage Schering bridge for the measurement of capacitance and power factor of cables during impregnation. A portable high voltage bridge for measuring the capacitance and power factor of cables and bushings is also shown.

W. & J. George & Becker, Ltd.—The "Nivoc" mirror and pointer galvanometer



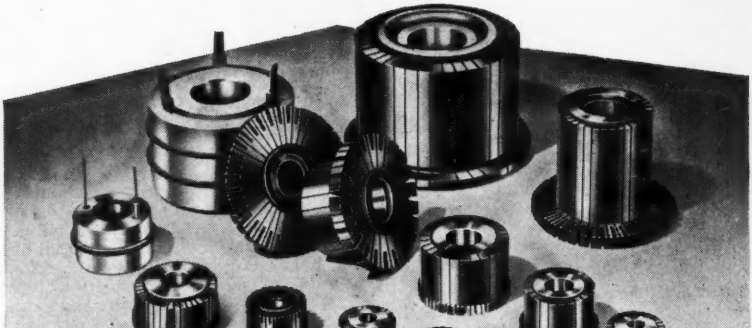
"Nivoc" galvanometer (George & Becker)

is a robust and sensitive instrument of the taut suspension type with a scale 7 cm long. It has a self-locking clamp which operates when the instrument is lifted from the bench. The movement is fully aperiodic, the deflection at one metre being about 40 mm per microamp and the period 1·2 seconds.

Gresham Transformers, Ltd.—Portable and miniature insulation flash testers and equipment for the safe testing of switchgear and transformer oils in which the voltage applied to the sphere gap is variable up to 45,000 V a.c.

Johnson, Matthey & Co., Ltd.—Electrical contacts of all types in a variety of forms. Precision drawn fine resistance wires in nickel-chromium, nickel-chromium-iron and copper-nickel in sizes down to 0·0005 in diameter. Also thermocouples, high-accuracy repetition parts in brass, aluminium and silver for instrument construction and strip for instrument springs and suspensions.

Kelvin, Bottomley & Baird, Ltd.—Teletorque units are embodied in an a.c. repeater system for the electrical transmission of position or intermittent rotational motion. When the rotor of one unit (the transmitter) is connected to a prime mover, and a second unit (the receiver or indicator) is electrically connected to the first, the indicator's rotor will accurately follow the motion of the prime



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TAYLOR 2574

mover. This motion is not limited in any way and the load put on the prime mover is practically negligible. The accuracy of repetition is within ± 1 degree.

George Kent, Ltd.—A self-balancing potentiometric recording or controlling instrument which is an electronic model of the well-known "Multelec." It is a high speed d.c. instrument with continuous balance and full scale traverse of two seconds operating at about ten times the speed of the standard galvanometer and mechanical relay type of instrument. It employs a convertor to alternate the out-of-balance e.m.f. followed by an a.c. amplifier to provide the necessary power to drive the slide wire and recorder.

J. Langham Thompson & Co.—An instrument for measuring the extremely small changes in resistance gauges for stress analysis. A carrier type amplifier is used, thus making the equipment suitable for the measurement of both static and alternating changes of resistance unbalance. The sensitivity is such that a bridge unbalance of 0·5 μV can be determined, thus making it possible to measure changes of resistance due to strain as low as 10^{-7} with a carrier voltage of only 2·5 V.

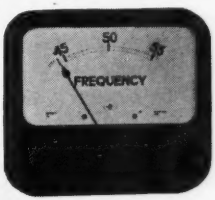
Marconi Instruments, Ltd.—A feature in the design of a direct-reading Q meter, or

Direct-reading Q meter (Marconi Instruments)

circuit magnification meter, for use in the frequency range 15-170 Mc/s in the employment of only one meter for the simultaneous monitoring of the injected and developed e.m.f.'s by a balance method which renders the oscillator level non-critical. The essential controls consist of an oscillator frequency dial, a slow motion turning dial for the test circuit and a dial directly calibrated in Q.

Measuring Instruments (Pullin), Ltd.—Three types of electrical resonance, pointer type, frequency meters which are unaffected by changes in supply voltage of up to 25 per cent. Apart from galvanometers other instruments include ammeters arranged to indicate the normal working current at two-thirds of full-scale deflection. The top portion of the

Resonance type frequency meter (Pullin)



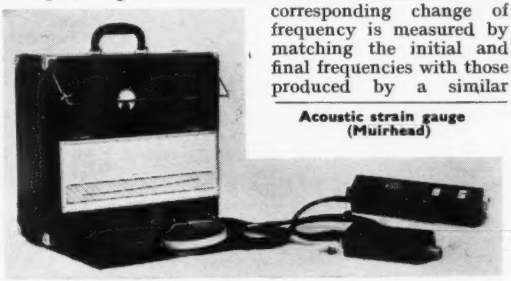
scale is suppressed so that surge currents of up to five times the normal running load can be indicated under test conditions, or when the full line voltage is suddenly applied as in the case of motor starting.

Metropolitan-Vickers Electrical Co., Ltd.—A demonstration of mechanical impedance apparatus for the determination of the elastic properties, both static and dynamic, of small samples of resilient materials such as rubber. Other exhibits include an electron microscope using magnetic lenses to give continuously variable magnification from 500 to 100,000 diameters, a multi-range test meter and valve-voltmeter, a direct reading probe magnetometer for measuring field strengths up to 3,000 H in gaps as small as 0·08 in wide and a miniature oscilloscope.

Mullard Electronic Products, Ltd.—Demonstration of a magnetic amplifier operating on audio frequencies. An interesting feature is the high carrier frequency employed (approximately 100 kc/s). Toroidal cores of "Ferroxcube" are used in the magnetic circuits; their high-frequency losses are low and consequently do not impose any stringent limitations on the choice of carrier frequency.

Muirhead & Co., Ltd.—An instrument measuring mechanical strain in terms of the change of frequency of a wire stretched between two supports held in intimate contact with the surface under test. Straining this surface alters the distance between the supports and hence the tension of the wire. The corresponding change of frequency is measured by matching the initial and final frequencies with those produced by a similar

Acoustic strain gauge (Muirhead)



Building two water heaters into one unit gives the advantages of ample hot water supplies with the economy of a small heater. Only the water required is heated—6 gallons constantly for the normal all-day-long requirements, and the bulk only when required for baths or clothes washing. Of national importance is the fact that the normal electricity 'load' is only ½ kw.—the bulk heater is commonly used in 'off-peak' periods only.

Further, 'Twin' electric water heating is scientifically economical. The heating elements are totally immersed and every unit of heat must pass into the water—there is no waste heat up a flue or chimney. Once in the water the heat is retained by a very efficient layer of lagging material packed between the inner container and the outer case.

Full details of this ultra-efficient multi-point heater are given in Publication HD 20. Ask for your copy Now !

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THE DOMESTIC APPLIANCES SECTION OF
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wire in a reference gauge, the tension of which is adjustable by means of a calibrated micrometer head operating through a spring. Both the test and reference gauges are maintained in vibration electromagnetically by amplifiers, and zero beat is indicated either aurally or visually.

Murex, Ltd.—The exhibits illustrate developments in the production of tungsten and molybdenum metals; molybdenum tubes now being made in this country for the first time. Tungsten X-ray targets are also shown and sintered permanent magnets for use in instruments.

Nash & Thompson, Ltd.—A four-range colour comparator with a sensitivity better than that of the average human eye. Two beams of light illuminate the specimen normally and are interrupted alternately by a rotating shutter. Light reflected at 45 deg from the specimens falls on a photocell which thus "looks" at each alternately. If the specimens are not identical the output from the cell has an a.c. component dependent on their difference, which is amplified and indicated.

Negretti & Zambra, Ltd.—An electro-pneumatic system for controlling the speed of large electric motors. The required speed is obtained by the Ward-Leonard system, and the electro-pneumatic set-up is used to adjust the speed precisely and provide control when the motor is subjected to 10 per cent load changes. The system controls essentially within a constant percentage of the "set" speed, and is capable of detecting changes of the order of 0·1 per cent at any speed.

Panax Equipment, Ltd.—A portable mains-operated instrument with a valve voltmeter, rate-of-count indicator and loudspeaker amplifier for the rapid location and measurement of radioactive sources. The equipment includes a thin window Geiger-Muller tube, and is housed in a wooden case.

Philips Electrical, Ltd.—An electron microscope of the magnetic type which is powerful in revealing microstructure even down to 25 Angstrom units and at the same time provides the convenience of operation required by investigators engaged in super-microscopy. In order to make it more compact and less liable to disturbances created by external magnetic fields, two extra magnetic lenses are fitted in addition to the normal set comprising the condenser, objective and projector lenses. This makes possible a continuously variable magnification covering the range 1,000-50,000 diameters without changing the pole pieces.

Plessey Co., Ltd.—High temperature X-ray diffraction camera which enables specimens to be examined at up to 1,500 deg C. The specimen can be rotated and/or moved in a vertical direction and also surrounded by a high degree of vacuum or any desired atmosphere. The film ring is entirely separate from the vacuum chamber and can be removed without disturbing any of the electrical, vacuum or water connections.

High-temperature X-ray diffraction camera (Plessey)

W. G. Pye & Co., Ltd.—Small compact apparatus for electrically measuring low pressure over a wide range. It contains its own power supplies and meters, the only external parts being the glass Pirani lamps and ionization gauge bulb, which are sealed directly into the vacuum system. A single multi-plate switch enables readings to be taken either on the Pirani gauge from 1 mm down to 10^{-3} of mercury, or on the ionization gauge from 10^{-2} mm down to 10^{-6} mm of mercury. Provision is also made to bombard the interior structure of the ionization gauge to de-gas the electrodes.

Salford Electrical Instruments, Ltd.—Valve-operated equipment for the rapid testing of watches and clocks. The average watch ticks five times a second when keeping correct time, and by comparing the frequency of the ticks with a standard frequency the watch can be quickly checked. The watch is placed on the test table, thereby causing a bright spot to appear on the screen of a cathode ray tube. This spot moves in a clockwise or anticlockwise direction according to whether the watch is gaining or losing, and the distance through which it moves round the circumference of a circle in a fixed time (say 30 seconds) indicates the rate at which the watch is gaining or losing. A small loudspeaker makes it possible to listen to the ticks and so detect mechanical faults.

Sangamo Weston, Ltd.—Amongst instruments for use in aircraft a two-element polyphase wattmeter is intended mainly for three-phase 400 c/s circuits. It operates on the thermoelectric principle measuring true three-phase power on a three-wire

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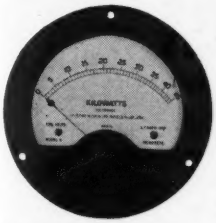
circuit under any conditions. A feature is that the indications are independent of waveform and frequency errors, and may be



Polyphase wattmeter for 400 c/s circuits (Sangamo Weston)

used on any power factor. A frequency meter is a ratiometer type circular scale indicator for aircraft use, and indicates frequencies between 300 and 500 c/s. It is independent of supply voltage fluctuations, and is accurate to within ± 1 per cent.

Short & Mason, Ltd.—The "Transet" controller, which is a compact instrument for reducing the size of control panels in the processing industries and to improve the quality of control by the reduction of lags normally present in the conventional transmission system. It functions as two independent instruments in one case actuated from a common source.

Siemens Electric Lamps & Supplies, Ltd.—For the measurement of the integrated luminous energy from a flashtube a photometer consists of an integrating sphere and photocell together with a circuit to measure the total quantity of electricity passing through the photocell. It is calibrated by means of a lamp of similar spectral composition to the flashtube which is operated for a definite period of time. An eight-band selenium rectifier which is also shown is for use in a laboratory spectral band photometer for the measurement of the luminance in eight agreed spectral bands of the radiation from fluorescent and other lamps. Measurement in eight bands is a recommendation of the recent C.I.E. meeting, and the cell is divided to conform to the wavebands provisionally agreed.

Southern Instruments, Ltd.—Transducers for converting physical quantities such as pressure or vibration into electrical quantities suitable for amplification and application to a recording or indication oscillograph. The capacitance and inductance pick-ups operate on a frequency-modulated system using a 2 Mc/s carrier. This has the advantage of being able to record down to zero frequency so that static calibration can be effected.

Standard Telephones & Cables, Ltd.—Low frequency analysing apparatus developed to the requirements of the Royal Aircraft Establishment for the examination of aircraft engine vibrations, and at the same time indicating the engine speed. It is arranged to scan continuously the frequency range from 6 to 400 c/s, using six modulator circuits arranged to cover the octave bands. The scan for the six channels takes place in 0·04 second, and in order to provide a continuous scan the modulation frequency for each band is varied over the octave once in five seconds. The analysis is therefore spread from a plain line presentation to a continuous area, the boundary of which gives the amplitude distribution of the complex wave.

Sperry Gyroscope Co., Ltd.—Prototype of an electronic simulator for the solution of problems involved in the design of servo-mechanisms. The complete mechanical or electro-mechanical system may be simulated, or the equipment may be coupled to a servo-system to replace certain links. It can also be used for the solution of certain types of differential equations.

Electronic servo-mechanism simulator (Sperry)

H. W. Sullivan, Ltd.—A series of inductance and capacitance standards for all frequencies, precision and second grade screened non-reactive decade resistance boxes for high

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frequencies and d.c. and a combined Kelvin and Wheatstone bridge.

Sunvic Controls, Ltd.—A demonstration of the operation of a high sensitivity, high stability d.c. amplifier when used to control the characteristics of a proportioning resistance thermometer controller governing the temperature of an electric resistance furnace. A thermocouple in the furnace is connected in series with a constant d.c. voltage which is manually standardized with a standard cell. The constant voltage source is adjusted to correspond to the thermocouple e.m.f. at the controlled temperature. Change in temperature causes potential difference to exist between the two sources, which is fed into the d.c. amplifier and subsequently operates a 5-0-5 mA recorder. The full-scale deflection represents ±2·5 per cent.

Taylor Electrical Instruments, Ltd.—A diversity of test equipment primarily intended for use in the radio industry including a resistance and capacitance bridge, switchboard and miniature instruments, ohmmeters and megohmmeters, and a valve tester and multi-range meter combined.

Telegraph Condenser Co., Ltd.—Demonstration of a discharge detector comprising a variable d.c. source together with a high gain amplifier feeding a loudspeaker, oscilloscope and integrating voltmeter. It indicates the onset of ionization or other forms of brush discharge and may be used to give direct comparisons between various dielectrics or impregnants. A wide range of miniature and other capacitors for special purposes is also exhibited.

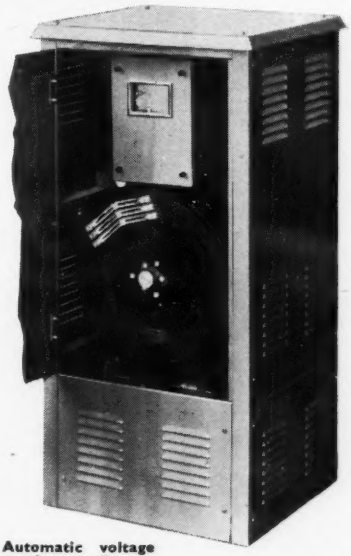
Telegraph Construction & Maintenance Co., Ltd.—A box-sealing compound which may be poured into the joint at a temperature just below 100 deg C, or injected at low temperatures with a grease gun. It has good water-repellent properties and is recommended for use in jointing multi-core plastic-insulated cables.

H. Tinsley & Co., Ltd.—Rapid means of checking strain gauge samples is provided by a suitable bridge working in conjunction with a four-point loaded beam. The beam deflection is set up on a dial, the balance point of the bridge indicating the gauge factor directly. By a slight modification of the circuit, the deflection dial can be eliminated and all measurements taken in terms of a standard gauge of known gauge factor.

Wayne Kerr Laboratories, Ltd.—A Q-meter providing means of energizing an echo box resonator with pulsed oscillation, and also measuring the time taken for a voltage on the rectified output waveform to decay from one fixed level to another. It will read Q directly, and at the present stage of development appears to be capable of making absolute measurements relative to a built-in time constant to within 0·5 per cent

Westinghouse Brake & Signal Co., Ltd.—The exhibit includes high voltage units employing a voltage multiplier circuit which enables an e.h.t. supply to be derived from the centre tapped h.t. winding as used in almost all forms of electronic equipment. They are designed to be connected directly to the normal mains transformer, and will deliver up to 5 kV at 150 μA. A range of metal rectifiers capable of operating at very high inverse voltages is also shown. A rectifier only 2·5 in long and $\frac{7}{16}$ in in diameter will withstand 3,600 V, and two such units will develop 5,000 V d.c. when used in a voltage doubler circuit driven from the flyback pulses which appear at the line scanning transformer of a television receiver.

Zenith Electric Co., Ltd.—A valve-operated voltage regulator comprising a bridge circuit and amplifier operating in conjunction with a split field a.c. motor, which in turn drives the contact arm of a toroidally wound transformer. Constancy of the output voltage can be maintained within 1 per cent with a variation in supply voltage of ± 10 per cent.



Automatic voltage regulator (Zenith)

THE ENFIELD
GRID SUSPENSION
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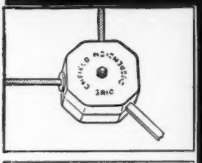

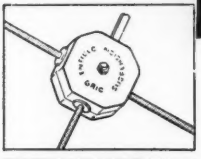

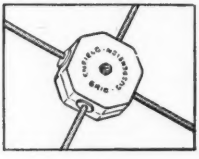

Catenary wiring
cuts out conduit

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Learning from Experience

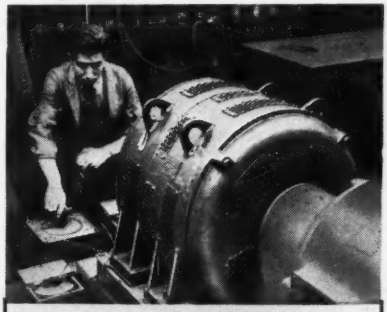
ELECTRICAL MACHINERY DEVELOPMENT BY A WOLVERHAMPTON COMPANY

THE manufacture of electrical machinery is a highly specialized business, the success of which depends to a very large extent on an appreciation of potential sources of trouble and on the knowledge of how to overcome them. Such knowledge can come along after long experience gained from studying operating conditions not only in Great Britain but all over the world.

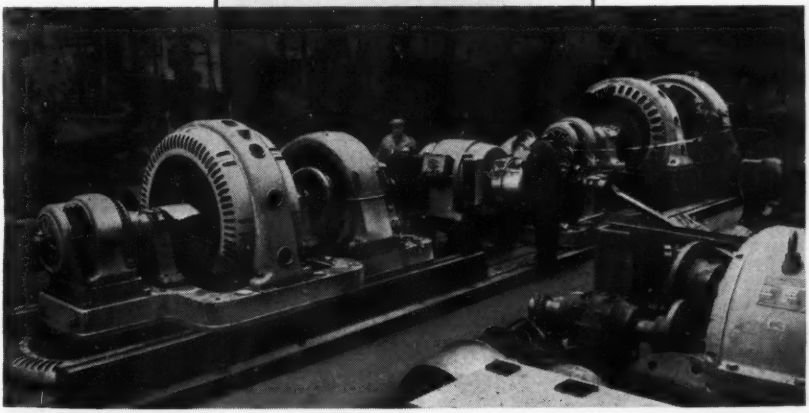
With a history dating back 62 years, the Electric Construction Co., Ltd., Bushbury Engineering Works, Wolverhampton, can well claim to have acquired this experience. Many of the earliest electrical developments were undertaken by the company or its predecessors. The earliest instance of the use of electricity underground, for instance, is believed to have been the lighting at Trafalgar Collieries, Forest of Dean, for which Elwell & Parker, the firm from which the company was formed, provided the dynamos and underground transmission system about 1883.

One of the earliest examples of electric traction, that at Blackpool, was also carried out by Elwell-Parker, Ltd., in 1884-1886. It was a slot system and each car was driven by a single bipolar reversible motor. In 1887 the submarine *Nautilus* was fitted with cells made by the company, and two years later an accumulator locomotive was constructed for Birmingham Tramways. The electrification of Liverpool Overhead Railway and the installation of a tramway system for the South Staffordshire Tramways, using overhead trolley wires, were both carried out in 1893, while one of the earliest electric vehicles, an electric dog-cart (complete, incidentally, with reins) was built in 1896.

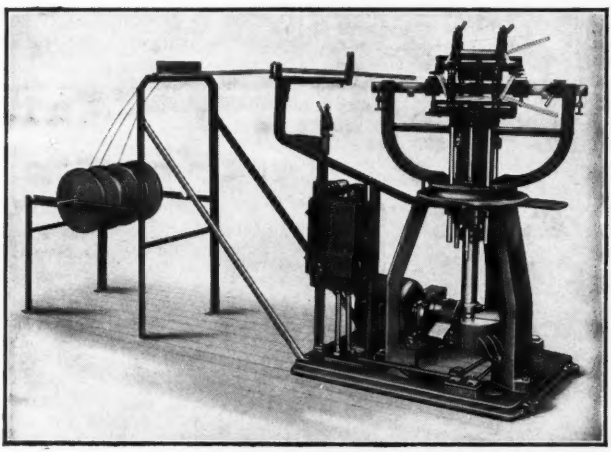
Many similar in-



H.f. motor alternator sets of this type have been sent to Argentina, Holland, Sweden and South Africa. They have an output of 20 kW at 550/500 V single phase, 5,000 c/s, 3,000 r.p.m. (above). A 700 kVA three-phase alternator, one of two on order for India, is to be seen on the right of this group of machines (below)



QUICKWAY ARMATURE AND MDC LTD COIL WINDING MACHINES



"Quickway" Adjustable Coil Winding and Forming Machine for making shaped Armature and Stator Coils in all sizes from 2 h.p. to 500 h.p., and with all kinds of conductors.

La machine réglable "Quickway" pour l'enroulement et la formation de bobines, servant pour la fabrication d'armatures à façon et de bobines de stators de toutes les dimensions depuis 2 HP. jusqu'à 500 HP. au moyen de conducteurs de tout genre.

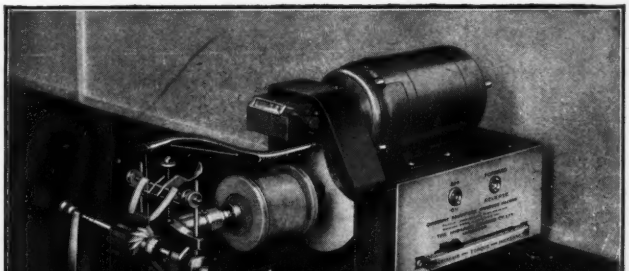
Enrolladora y Formadora ajustable "Quickway," para hacer inducidos persilados y bobinas de estator en todos los tamaños desde 2 HP hasta 500 HP, y con conductores de todas clases.

FOR PORTABLE ELECTRIC APPLIANCES

"Quickway" Adjustable Armature Winding Machine. Lays up to 400 turns per minute of 45 SWG to 24 SWG.

Les machines réglables "Quickway" pour l'enroulement d'armatures. Capacité de travail 400 tours par minute de 45 SWG à 24 SWG.

Enrolladora ajustable de inducidos "Quickway" que enrolla hasta 400 vueltas por minuto de 45 SWG a 24 SWG.



THE MIDLAND DYNAMO CO. LTD. 64 BELGRAVE GATE

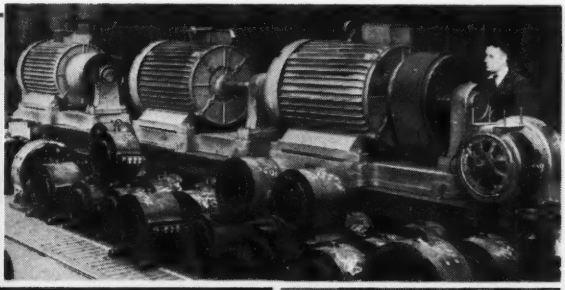
TELEGRAMS "DYNAMO" — **LEICESTER, ENGLAND** — TELEPHONE 20172/3/5

Learning from experience (*Contd.*)

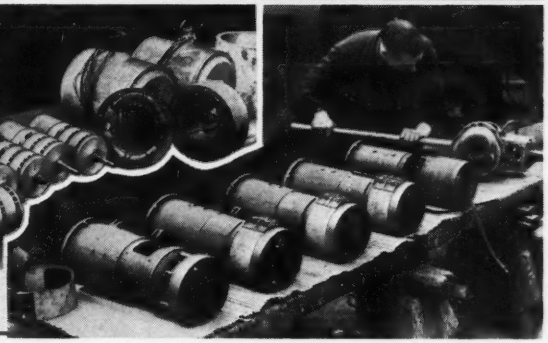
stances of enterprise in introducing new ideas could be quoted. Some of them have been developed by other manufacturers, but others have remained with the company, being gradually expanded and improved until to-day the range of products manufactured is in demand all over the world on account of their modern design, reliability and suitability for their purpose. Actually about 40 per cent. of all products are now being sent overseas, a remarkably high proportion in view of the big demand for many of the items in this country.

Production is nowadays concentrated on four main lines—rotating electrical machinery, switch- and control-gear, static transformers and rectifiers. Among the great variety of motors and generators manufactured are a high proportion of special units, and when we visited the works recently we had an opportunity of seeing some of these. One of the most interesting was a high-frequency alternator set, with an output of 20 kW at 550/500 V, single-phase, 5,000 c/s, 3,000 r.p.m. for the Electric Furnace Co., Ltd. Similar units have been exported to Argentina, Holland, Sweden and South Africa and sets up to 150 kW have been supplied or are on order for India and Poland.

Motors for hoisting lifeboats from water to ship are being specially manufactured for Samuel Taylor (Brierley Hill), Ltd. A notable feature is their lightness to permit easy movement from one winch to another. Normally four are used in the larger ships, and two in tankers and smaller craft. The 6 h.p. models, which weigh only 110 lb, are fitted in cradles for portability and have been supplied to ships of most countries, including Canada. They run at 6,000 r.p.m. with gear reduction to 600 r.p.m. A smaller unit of 4 h.p., provided with handles instead of the cradle, is just coming into production to replace machines previously obtained from the United States. Special machines for use in lighthouses are another product destined for such diverse places as Northern Norway and the East Indies.



Three totally enclosed air-blast blow-over type slip-ring motors (150 h.p. three-phase, 400 V, 50 c/s, 750 r.p.m.) for the sisal industry of Tanganyika, and (below) tone inductors for telephone exchanges

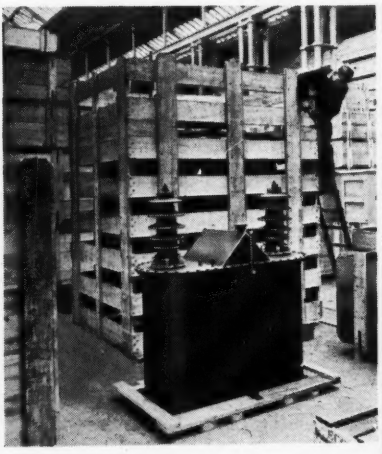


Special motors for use on lifeboat davits (right)

Learning from Experience (*Contd.*)

Spain and Portugal, South Africa, Australia, New Zealand, Canada, and Newfoundland are among the countries for which orders have been received recently for tone-inductors for use in telephone exchanges. These machines provide the operating tones of the system and in general serve 10,000 lines. Motor-generator sets to furnish the main power for the exchanges are also supplied to the telephone installation manufacturers who are providing the main equipment.

Many orders are in hand for alternators for, among other places, Australia, Iran, Siam, India, Greece and South Africa. Being tested during our visit was one of two 700 kVA three-phase alternators for India. A 750 kVA three-phase alternator was in process of manufacture for Dares-Salaam, to which place eight 1,190 kVA sets have already been sent. In addition, nine 400 kVA alternators for South Africa were in course of construction.



70 kV, 15 kVA transformer for sulphuric acid precipitation with, behind in crate, a 1,000 kVA transformer to replace a unit destroyed by the Japanese in Kuala Kamper, Malaya

Much machinery is supplied to textile manufacturers. No fewer than 40 motors, including five of 400 h.p., are being made for one Indian jute mill as part of the complete electrical equipment being supplied by the Electric Construction Co., Ltd., and we saw nearing completion three totally-enclosed air-blast blow-over type slip-ring motors, each of 150 h.p. three-phase, 50 c/s, 750 r.p.m., which form part of a large order for the sisal industry of Tanganyika. Plant for cotton mills in China was also seen.

Among other especially interesting plant in hand for overseas may be mentioned six 1,700 A motor-generator sets for Spain, two-, three- and four-speed motors to meet the heavy reversing duty on capstan lathes; high-frequency motor-generators for injecting low voltage into supply mains for ripple control; motors for a South African cold storage installation; and motor-generators for a Norwegian sulphuric acid precipitation plant. Other apparatus for the last-mentioned installation to be seen in the transformer and switchgear departments were a single-phase, 70 kV, 15 kVA transformer, its accompanying 70 kV circuit breaker, the rotating-type mechanical rectifier and its associated control panel.

Practically every variety of control gear for a.c. and d.c. motors and generators is made, as well as switchgear of many other types, including heavy gear for central-station work. One switchboard in hand during our visit was for the Abbasi Textile Mills, Rahim Yarkhan, Bahawalpur State, India. Another similar unit was for Santa Izabel, Maranhao, Brazil. Several other orders are in hand for South America. A number of switch cubicles for Burma Railways were nearing completion, as well as some of the 47 draw-out control panels for a Calcutta cotton mill.

The switchgear for the electrification of the Indian jute mill referred to earlier had recently been completed, and several control panels were in hand for the 1,700 A motor-generator sets for Spain. An ozone-producing plant for water sterilization, under construction for the City of Manchester Water Department, is a new development likely to prove of interest overseas.

Transformers are made in all sizes up to about 10,000 kVA. Units had just been completed for Portugal and Malaya, the latter including one of 1,000 kVA for Kuala Kamper, part of the equipment supplied for rehabilitation after the

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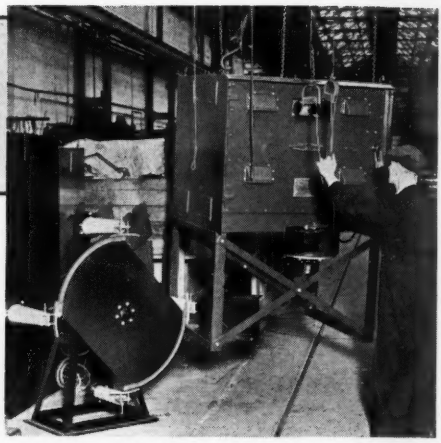
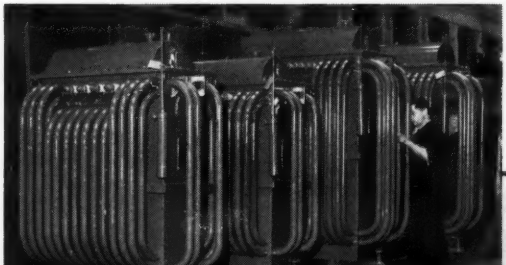
Learning from Experience (*Contd.*) destruction done by the Japanese. Two 500 kVA and three 400 kVA transformers were in the Despatch Department ready to go to South Africa which is the company's largest overseas customer for this class of equipment.



70 kV circuit breaker with mechanical rectifier on the left for sulphuric acid precipitation equipment for Norway

The transformer department also makes the smoothing filters for reducing to a negligible amount the high-frequency ripple in the d.c. output of the motor-generator sets made for power supply to telephone exchanges. Special transformers connecting the high-frequency motor-generators to the mains for ripple control are also made. They inject the low-voltage, high-frequency output of the machines into the high voltage, standard frequency system.



400 kVA and 500 kVA transformers for South Africa, and (below) "Varispeed" drive operating a sizing machine in a textile works at Ghent, Belgium

Power transformers are in hand for Egypt, Africa, South America, Australia and India of sizes up to 4,000 kVA, including a number of repeat orders. Recently transformers have been despatched to Portugal, South America, Iran, Finland, South Africa and India, including three 2,000 kVA and two 850 kVA units for the jute mill electrification mentioned earlier. An appreciable part of the output of this department is represented by the transformers and chokes for the metal-plate and mercury-arc types of rectifier manufactured by the company, ranging from small battery chargers up to equipments to supply bulk power, such as is required, for example, in traction systems.

Among the various metal-plate rectifiers being made were air-cooled, oil-immersed units for electro-plating. The twelve years' experience gained in the manufacture of such rectifiers has culminated in a recently developed design especially suitable for export, in which all the cooling tubes are internal.

Learning from Experience (*Contd.*)

Examples of the company's plating equipments are already at work in Norway, South Africa and India.

Air-cooled rectifier units of both the metal-plate and mercury-arc types for providing power supply to exchanges are included in many of the telephone contracts mentioned earlier, and rectifiers were also included in the jute mill electrification.

Some of the apparatus we saw was intended for use in conjunction with the company's patent "Varispeed" drive which, utilizing a d.c. variable speed motor, is claimed to give much more efficient and economical results than any other type of variable speed unit for use on an a.c. supply. Drives of up to 300 h.p. have been supplied, or are in course of manufacture for the United States, Canada, South America, Egypt, France, Belgium, Australia, India, China and Holland. A "Varispeed" drive for operating a Hibbert sizing machine for the textile industry is shown in one of the illustrations working at Ghent in Belgium. This special drive for textile machines is a big advance, and consequently is opening up a new field in the dollar countries.

All the rectifier bulbs used for the mercury-arc rectifiers, including those incorporated in the "Varispeed" drives, are made in the factory. We saw a typical mercury-arc rectifier for bulk supply on test before its despatch to a Norwegian mine. Several South American countries, Spain, Portugal, Switzerland, France, Belgium, Holland, Australia, New Zealand and Eire have recently placed orders for rectifiers and "Varispeed" drives.

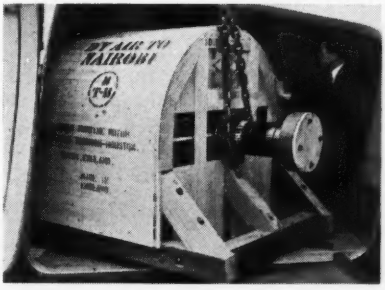
Finally we would mention the metal-plate rectifiers for incorporation in plant for the electrostatic precipitation of coal tar, light oils, cement dust and the like. These have capacities ranging up to 45,000 V 100 mA. Some have already been supplied to Finland, Canada, Norway and Shanghai, and among those now being manufactured a large proportion will be exported.

Turbine Rotor Sent by Air

NOTABLE RECONDITIONING FEAT

THE rotor for a BTH 1,500 kW turbo-alternator has recently been flown from Elmdon Air Port, Birmingham, to Nairobi in Kenya. By utilizing air transport, this rotor was at its destination, Ruiru, Kenya, only three days after leaving the Rugby works. It was urgently required so that the set, which operates in association with hydro-electric plant, could be put on load at the very earliest possible moment, the operation of the hydro-electric plant suffering from shortage of water.

It was in 1944 that Balfour Beatty & Co., Ltd., on behalf of the East Africa Power & Lighting Co., Ltd., purchased this turbo-alternator, which had been installed in a northern power station and had become redundant. Being in first-class condition, it was dismantled, despatched to Kenya and re-erected on its new site. Recently, after about five years' service, it was decided to return the rotor to Rugby for reconditioning. While it was in transit, the necessary material was prepared so that work could go ahead immediately the rotor arrived.



Rotor of 1,500 kW turbo-alternator being loaded into the aeroplane at Elmdon Air Port en route for Kenya

Arrangements were made by Balfour Beatty & Co. for returning the rotor and associated parts by air, and a special aeroplane was chartered and preparations made for loading-up in a prescribed

ELECTRICAL EQUIPMENT FOR INDUSTRY

B.I.C.C. is the World's largest organization concerned with the manufacture, marketing and contracting of electrical transmission, radio and telecommunication equipment.

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Turbine Rotor Sent by Air (*Contd.*)

time. Work was completed, the rotor balanced, specially packed, and the whole consignment delivered to the aerodrome by the due date. Limited headroom in the aircraft and somewhat inadequate lifting facilities at the aerodrome rendered the process of loading rather difficult, but the main piece was finally manhandled into its correct position in the aircraft and properly secured against movement.

Arrangements had been made for one of the British Thomson-Houston Co.'s engineers, who was erecting a large compressor in Rhodesia, to be available in Ruiru when the rotor arrived. It was expected that the work on site would be completed and the machine recommissioned in about fifteen days after the rotor left Rugby. This feat of dismantling a steam turbo-alternator in a somewhat remote spot in Central Africa, returning substantial parts of it to the maker's works for reconditioning, the reconditioned parts being flown back and the set put into commission again within three months is certainly an achievement which reflects credit on all concerned.

Air-Blast Circuit Breakers

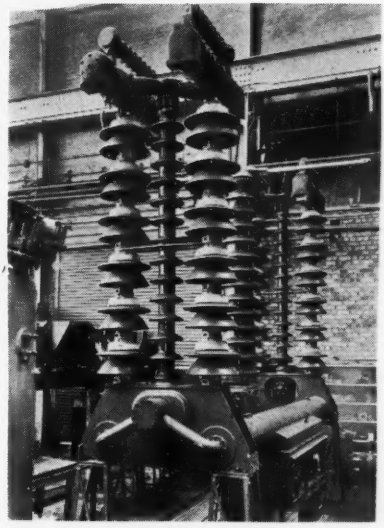
220 kV EQUIPMENT FOR FINLAND AND POLAND

ON the Continent, in particular, the use of air-blast circuit breakers is gaining popularity. Several substantial orders are now being dealt with by the Metropolitan-Vickers Electrical Co., Ltd., at its Trafford Park, Manchester, works where a range of such breakers (type GA) has been developed for outdoor service at voltages from 66 kV to 275 kV and with breaking capacities up to 5,000 MVA.

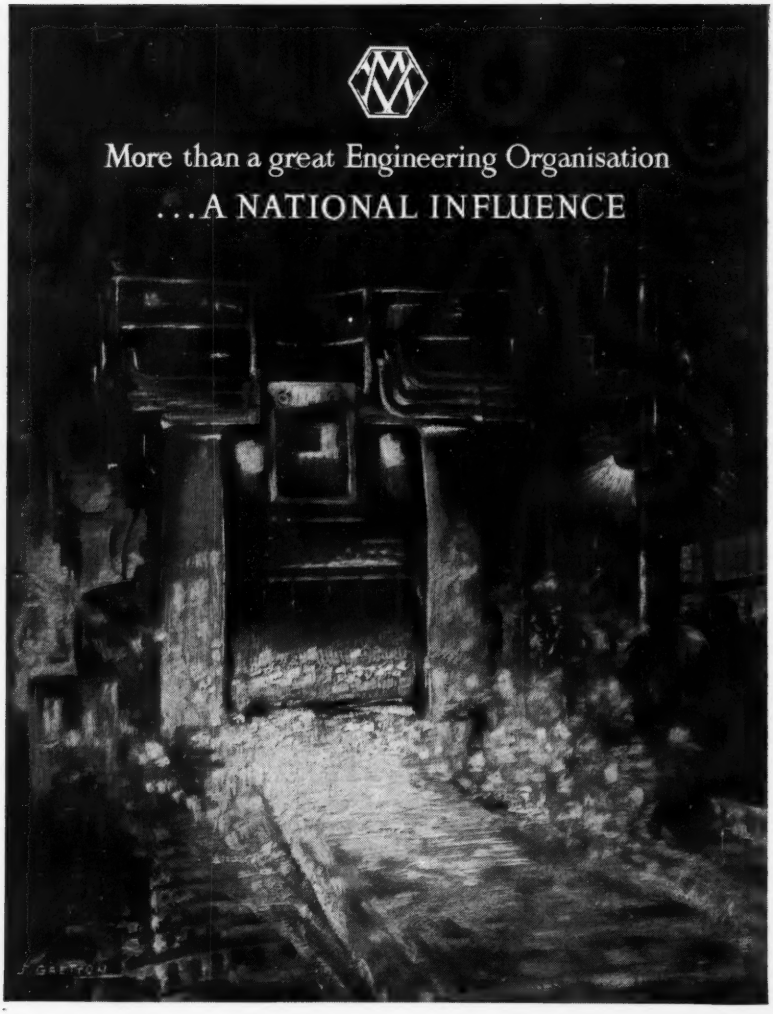
In addition to an installation of 132 kV air-blast circuit breakers in this country, about seventeen 66 kV breakers are in service at the Catalagzi station in Turkey. Work is in hand on eight 220 kV and thirty-four 110 kV air-blast breakers for Finland, to be followed by six 220 kV and ten 110 kV breakers for Poland and some breakers for 165 kV service in Portugal and for 110 kV in India.

Special advantages of this type of gear are the high-speed interruption and the readiness with which it can be adapted for high-speed reclosure to obtain a high degree of continuity of service. These breakers are capable of interrupting heavy and frequent short circuit currents without being taken out of commission for maintenance. Operating times are of the order of 3 to 4 cycles from receipt of trip impulse to circuit interruption. In closing, the operating time is about 0·25 second; this quick action assists materially the operation of synchronizing.

Of particular interest is the arrangement for resistance switching with "Metrosil" resistors shunted across each set of contacts. "Metrosil" is a ceramic material with non-linear characteristics; its resistance varies inversely as the fourth or fifth power of the instantaneous voltage. Resistors with this characteristic are applied across the contacts of an air-blast circuit breaker to control the voltage gradient and to limit any over-voltage.



"Metrovick" mercury arc rectifier cubicles of the glass bulb type for Pretoria on test. This is part of an order for fourteen cubicles. Each cubicle is rated at 150 kW, 550 V 273 V for trolley-bus substation service



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A/C 902

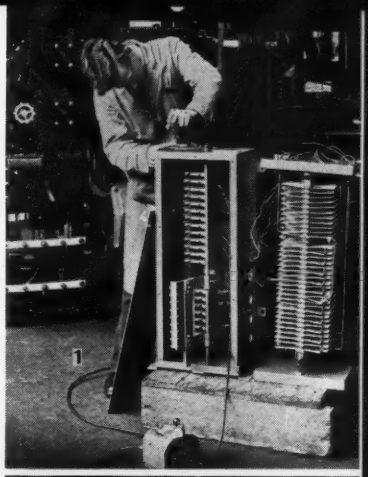
Automatic Control

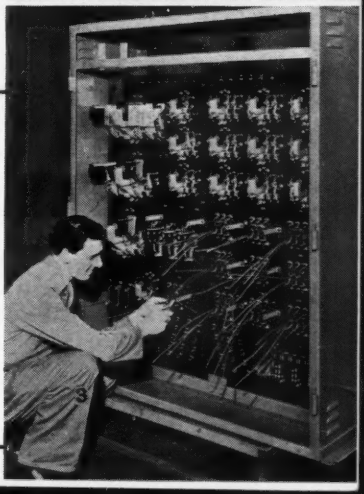
MEETING THE DEMAND FOR SPECIAL EQUIPMENT

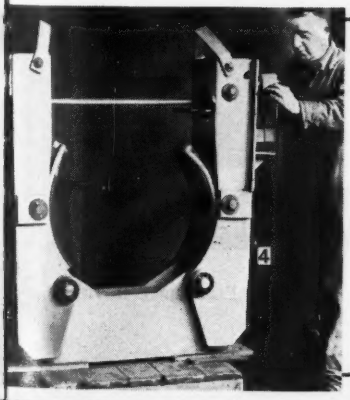
APART from such prominent British edifices as the Houses of Parliament; Canterbury Cathedral; the Shakespeare Memorial Theatre, Stratford-on-Avon; Barton power station, Manchester; and Paddington railway station, London, many notable overseas buildings, among them the State Opera House, Lisbon; Manners Mansions and Witwatersrand Technical College, Johannesburg; and Selangor railway station, Malaya, have been equipped with " Dupar " electrical control gear made by Dewhurst & Partner, Ltd., Inverness Works, Hounslow. At present about 45 per cent of the total production is going abroad.

Throughout the thirty years of its existence the company has specialized in all forms of automatic control of motors up to 500 h.p. particularly contactor controllers, drum controllers and electro-magnetic brakes for use with lifts, cranes, hoists, pumps compressors, refrigerators, etc. The range of equipment made for control of lifts is especially comprehensive and includes limit switches, electromechanical gate locks, door and car gate contacts, overspeed governors, floor direction and selection switches, automatic cage and landing gate or door operators, electromagnetic brakes, phase reversal and failure relays, electromagnetic rope grippers, luminous indicators, and push buttons, etc. Some idea of the extent of the equipment provided to give the latest refinements in lift operation may be gathered from the fact that a typical dual control board recently supplied to Johannesburg measured 22 ft long by 7 ft 6 in high.

One of the largest equipments under construction when we visited the factory recently was a control







(1) Drum controller for crane on test

(2) Refrigerator panel for a merchant ship, with pivoted mechanism to give easy access

(3) Tropically finished refrigeration control panel nearing completion for Bulawayo

(4) Electromechanical brakes are made in all sizes from 2 in to 30 in. This is a 25 in diameter 3-phase unit

PANEL MOUNTING INSTRUMENTS

There is usually an instrument in the 'Victoria' range to suit most users' needs. When, however, the occasion demands a special meter for export, outside the scope of normal requirements, every facility is available at Victoria Instruments for design and production in large or small quantities Enquiries for "purpose made" instruments are welcomed.

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SQUARE FLANGE METERS

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The Nettle range of Shockproof Electrical Accessories is indeed one family — every member of it possessing a distinct personality yet each characterized both as to materials and workmanship by the same high standard of quality. The group on the right includes the new Nettle Catalogue, copies of which are available to the Trade upon request.

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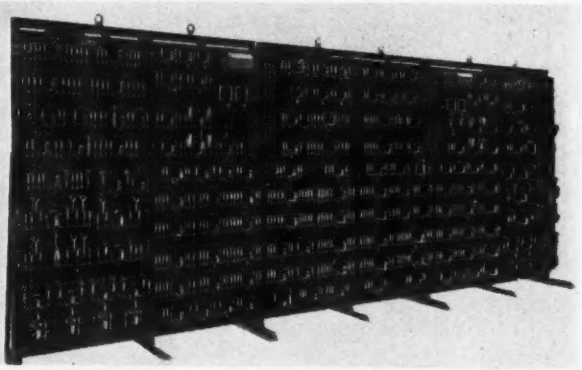
Automatic Control (*Contd.*)

desk, one of a pair, for sheet steel coating. There were also several controllers for textile machinery, furnaces, cranes and ships' refrigerators, some of the units for the last-mentioned item having the mechanism pivoted to give easy access. Many contactors were being made for brake control of railway rolling stock. Electromechanical brakes are now being supplied in all sizes from 2 in to 30 in diameter for use from d.c. and single- or three-phase a.c. supplies.



Dual control lift panel recently supplied to South Africa

A recent development in the design of the enclosed type of control gear is the use of a folded method of sheet steel construction instead of angle iron for the framework, this securing a reduction of about 25 per cent in the weight of the apparatus. Another point of interesting production is that only one set of jigs is employed to produce push button and key switches of from one to eighteen ways. A neat range of drum type switches is eminently suitable for reversing control of squirrel-cage motors of up to 7.5 h.p.

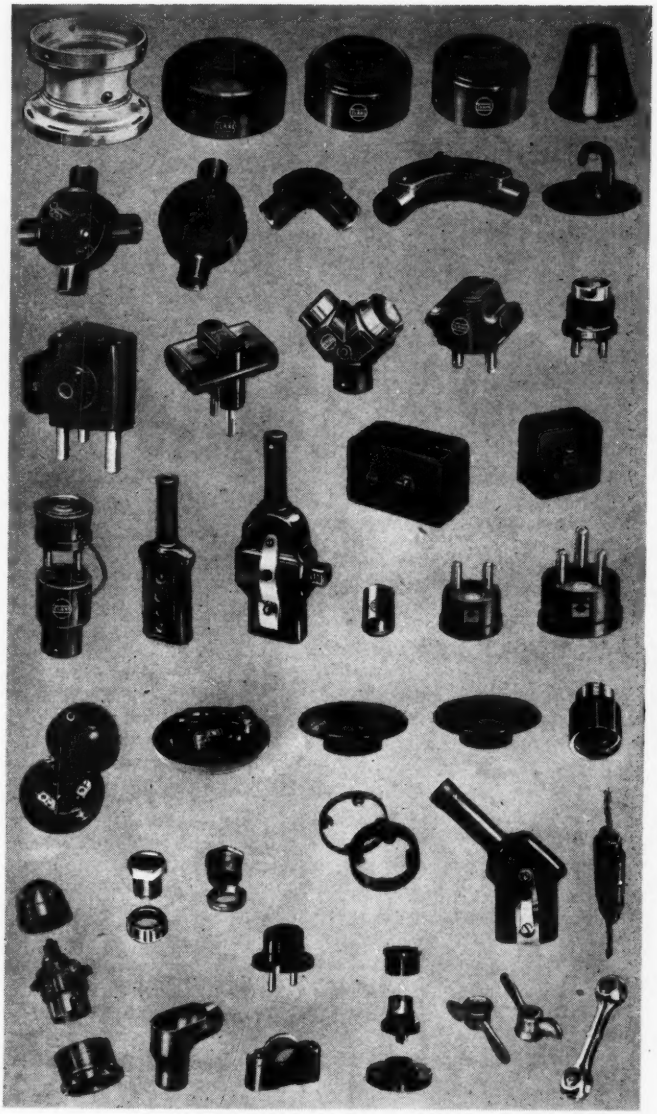
Assembling lift floor selector unit

Generating Plant for the Antarctic

A COMPLETE range of petrol, paraffin or diesel-driven automatic generating plants, which start on the operation of any switch and stop when the load ceases, is now available from A. C. Morrison (Engineers), Ltd., Quorn, Loughborough, in capacities from 500 W to 12 kW. One particularly interesting recent order is for units for the British-Norwegian and Swedish Antarctic Expedition. A batch of 220 sets is being sent to Argentina, as well as 39 to New Zealand, 300 to India and Pakistan and 164 to Kenya and Tanganyika where the plants are used on farms, particularly in connection with the groundnut scheme. Very large orders have also been received from Brazil, Chile, Peru, Canada, South Africa, Malaya and Egypt.

Radio for Drainage Scheme

THE General Electric Co., Ltd., has been awarded a contract to supply v.h.f. radio equipment to the West Middlesex Drainage Department. It is believed that radio will be of considerable use in maintaining contact between headquarters and mobile maintenance parties.



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Quality Production

CONCENTRATION ON EVEN HIGHER STANDARDS

A CRITICISM of British export goods frequently heard before the war was that their quality was too high and that inferior products selling at lower prices would have been more suitable for meeting competition from other countries. Since the war, far from adopting this principle, most manufacturers of electrical appliances have aimed on raising the standards of their products still higher: in fact it has been the general policy not only to let customers abroad have first call on the most sought after appliances but also to reserve the goods of the highest quality for export. Nevertheless it has been found possible to keep down the prices to a level which permits them to compete abroad on favourable terms with manufacturers of other countries.

The name of the Gramophone Company and its trade mark " His Master's Voice " are well known all over the world in connection with radio apparatus, gramophones and records. Perhaps not yet so widely known are the company's activities in the field of domestic electrical appliances. The HMV Household Appliances Division began operations in 1932 and has concentrated on producing a range of products with the highest possible performance and efficiency and advanced design.

(1) Drilling moulded iron handles. (2) Maximum efficiency of an electric iron depends on grinding the sole plate quite flat. (3) Testing automatic controlled heat irons

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embody in every commutator they make their great technical skill and ingenuity, thereby ensuring superlative service.

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produce larger and larger quantities of the pure mica insulated steel built-up commutator, and have now applied the new technique of modern plastics and their long experience to the production of moulded commutators.

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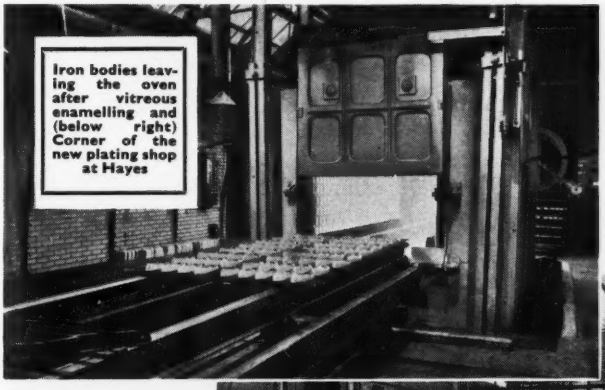
Quality Production (*Contd.*)

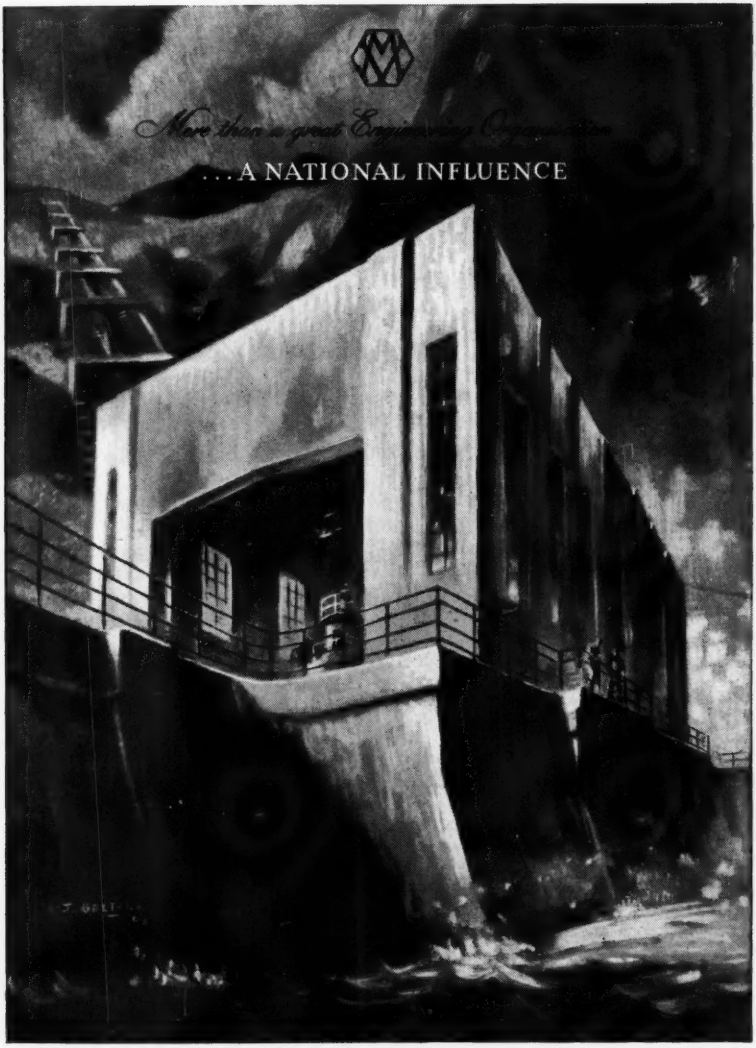
To achieve this, the company's team of industrial artists, working in conjunction with skilled technicians, have produced a range of products which represent marked advances on conventional practice and are not only easier to handle and operate but are more efficient and economical. Furthermore every appliance besides being attractive in appearance has been designed to facilitate cleaning.

Brazing on the spout of a "Bantinck" kettle

The range of products being made is constantly being enlarged and it now covers such apparatus as irons, radiators, toasters, kettles, coffee percolators and hair dryers. The latest iron, the IC 5, is a development of the heat controlled model introduced over fourteen years ago. To minimize fatigue and give smooth working it has been carefully balanced and the $\frac{1}{2}$-in thick chromium-plated sole plate has been highly polished. The heat-control knob has an extension for quicker manipulation. The primrose vitreous enamelled body is unbreakable and the heatproof black moulded handle is suitable for right- or left-hand operation. The iron weighs $5\frac{1}{2}$ lb and is rated at 750 W. Though the weight has been reduced to a minimum the company's travelling iron has a full-sized sole plate. The folding moulded handle is held rigidly in position by a special clip. Each model is supplied with adaptors which enable it to be used on Continental and American voltages. Most outstanding among fires is the "Bruton" model, the reflector of which has a wide double curve enabling the greatest number of people to share the warmth; the highly polished chromium plated finish ensures maximum radiation of



Iron bodies leaving the oven after vitreous enamelling and (below right) Corner of the new plating shop at Hayes



HYDRO-ELECTRIC GENERATING PLANT A/C 901

Water turbine-driven Generators, Transformers, Rectifiers, H.V. & L.V. Switchgear, Instruments, Meters and Relays, Motor and Control Gear, Synchronous Condensers, Supervisory and Automatic Control Equipment, Voltage Regulators, Isolators, Lightning Arrestors, Feeder Protective Gear, etc.

"Covering every side of the Electrical Industry"

METROPOLITAN-VICKERS ELECTRICAL CO. LTD., TRAFFORD PARK, MANCHESTER, 17

Quality Production (*Contd.*)

the heat. Both 2- and 3-kW models are available. Two other noteworthy 1-kW and 2-kW reflector fires are the " Portman " and the " Welbeck," which are basically similar, but the latter has a hinged instead of a fixed base. The reflectors in these models throw the heat forward, the elements being so fitted as to obtain the maximum concentration of heat. For standing on a floor or hanging on a wall the " Belgrave " pressed steel portable fire is well designed yet inexpensive, and its carrying handle remains cool at all times.

A heater of a different type which has already met with considerable favour abroad is the " Cavendish " model. Incorporating a fan it supplies a constant uniform circulation of 120 cu ft of warmed air per minute and will raise the temperature throughout an average room 7 deg F in 15 minutes and 14 deg F in 90 minutes. It has the top and louvres moulded and finished in heat-resisting enamel in cream and purple brown or French grey and saxe blue.

Both the company's kettles mark a striking departure from conventional design. The " Bentinck " incorporates a massive moulded heat-proof shield handle to protect the hand from scalding, while the " Maddox " resembles a hot-water jug in appearance. The former with a loading of 1,500 W boils three pints of water in seven minutes, the latter (1,000 W) takes 10½ minutes. Though essentially modern the two coffee percolators, the " Molton " and the " Claridge," blend well with period table appointments.

Besides an upright toaster with a new-type graduated element suspended by a patented method to give longer life, there is a horizontal model which has a reversible hinged frame taking two slices of bread simultaneously. Because of its large toasting area its use is not confined to standard slices or shapes. The lid contains a useful toast rack.

The final appliance in the present range is a hair dryer. It has no projecting nozzle to disturb the hair and its radial-axial fan provides a uniform

Quality Production (*Contd.*)

constant temperature air stream. There is finger-tip control for hot and cold air and the adjustable stand makes it unnecessary to hold the dryer.

Production of these various appliances is being carried out at the company's works at Hayes, Middlesex, and Treorchy, South Wales. With a view to improving still further the high quality finish of the products the company has just provided at Hayes (Middlesex) an extensive new plating department equipped with the most modern plant. This new shop forms an appropriate complement to the company's up-to-date vitreous enamelling plant.

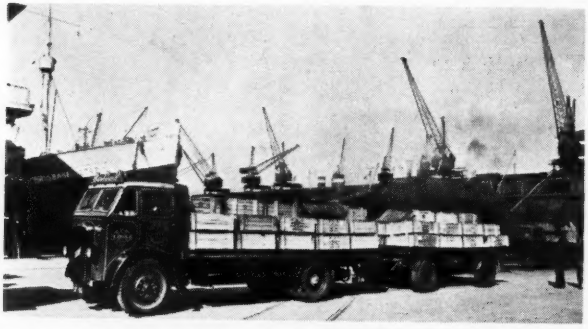
With its own branches or distributors in almost every country in the world the HMV organization is excellently placed for extending its overseas business in domestic appliances.

Fractional H.P. Motors for Australia

PROMPT DESPATCH OF A LARGE ORDER

THAT heavy engineering in the United Kingdom is playing a big part in the export trade is generally realized, but the extent of the effort being put forward by the lighter engineering side is not so often appreciated. The British Thomson-Houston Co., Ltd., which claims to be the largest manufacturer of fractional-horse-power motors in this country, has been steadily increasing its output over many years and, since the war, has brought into operation new factories for the production of these machines.

The company is exporting motors to many parts of the world and is able to despatch promptly against the many demands received. A typical instance is a recent one from Australia. A cabled order was received late one afternoon in April for 1,000 ¼ h.p. a.c. single-phase motors, with a request that they should all be shipped as soon as possible. The order was transmitted to the company's Newcastle-under-Lyme factory and such is the flexibility in manufacturing programmes that the 1,000 machines were completed and crated for shipment by the eighth working day; on the afternoon of that day they were on their way to Liverpool for loading in the *Brisbane Star*.



Lorry and trailer with consignment of 1,000 B.T.H. fractional h.p. motors on arrival at Gladstone Dock, Liverpool, by the bows of the *Brisbane Star*, which took the motors to Australia

While this may not be a record, it certainly is evidence of the company's ability to deliver the goods.

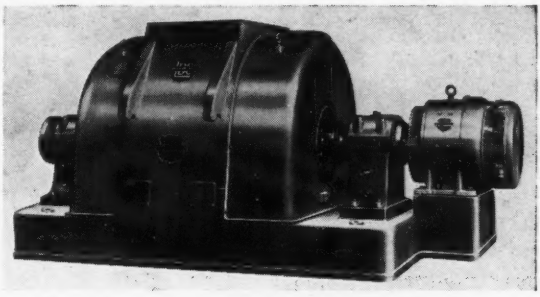
OBSERVATORY TIME INSTALLATIONS

THE "Synchronome-Shortt" free pendulum and slave, which established world records for time-keeping in 1925, still holds the record for pendulum clocks. It is installed at Greenwich and at many other observatories throughout the world. The manufacturers, the Synchronome Co., Ltd., Mount Pleasant, Alperton, Middlesex, have orders in hand for a considerable number of these instruments including six for Russia, two for Egypt and one each for Colombo, Warsaw, Lourenço Marques and the Institute Geografico Militar, Buenos Aires.

Motor Reliability—*contd.*

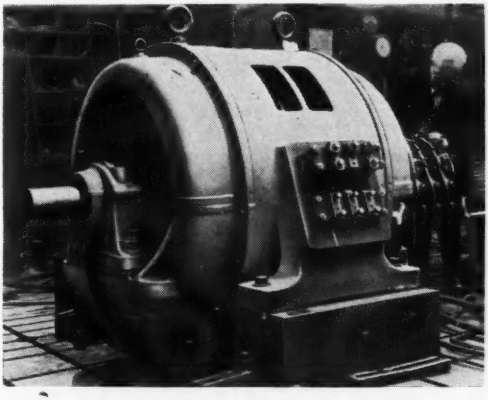
company's Willesden and Cardiff factories.

So busy are the Trafford Park works that a new factory has just been acquired at Liverpool to house the press shop and so permit a much needed expansion of the armature shop. Many of the machines in course of construction during our visit were of the totally enclosed type incorporating the company's special system of cooling by means of blowing air through tubes embodied in the cores. These machines are especially suitable for dirty atmospheres. Most of those we saw were for South Africa. In the winding shops we were particularly interested to notice the care that is taken in securing complete impregnation of shunt coils, the wire being passed through varnish as it is being wound.



1,250 kVA 3,300 V 3,000 r.p.m. turbo-alternator with closed-air-circuit ventilation for Cradock municipality

One of the largest machines being made was a 1,500 kW 3,300 V 1,500 r.p.m turbine-driven alternator, the third machine to be ordered for the Freetown power station, Sierra Leone. On test was a 1,200 h.p. 3,000 V 590 r.p.m. motor for the Shell Petroleum installation at Curaçao. This is of the same type as two previous machines and there is a further one on the books. Four 220-h.p. 3,300 V 975 r.p.m. motors in various stages of construction will drive ventilating fans at Mulajore, India; also destined for India was a 360 h.p. 3,300 V 740 r.p.m. totally-enclosed air-cooled squirrel-cage induction motor, the last of four for the Power Gas Corporation.



750 h.p. 415 V 990 r.p.m. motor for Australia for driving a high lift pump through flexible coupling

Oil engine driven alternators included a 505 kW, 6,900 V 375 r.p.m. machine for Broken Hill, Australia, two 162 kW 190 V 1,000 r.p.m. units for Syria and a 475 kW 440 V 428 r.p.m. machine for Kerang. Three steam-engine driven units for Australia were a 280 kW 440 V 375 r.p.m. alternator for Sydney, a 88 kW 415 V 600 r.p.m. unit for Fremantle, and a 200 kW 240 V 214 r.p.m. for Mount Gambier. Among other interesting orders in hand were two 200 kW 400/230 V 428 r.p.m. for the Iraqi Railways, two 750 h.p. 415 V 990 r.p.m. for a high lift pump drive at Sydney, N.S.W., two 190 h.p. 400 V 750 r.p.m. self-starting synchronous motors for the British American Tobacco Co., Calcutta, and a 75 h.p. 550 V 875 r.p.m. crane motor for the Dominion Bridge Co., Canada. With the opening of the new Liverpool works it will be possible to advance delivery dates very considerably.

INTERCHANGEABILITY —

STANDARD FIXING CENTRES of 84 mm. and consistent proportions permit installation of Kersons "Quail" and "Quail-Minor" accessories within the popular break-down type boxes for a wide variety of assemblies. Combinations of Socket and/or Switches for single boxes, and Sockets, Switches and Bell Push for built-up box sections up to 4-gang are standardised in the 4050 and 4060 flush plates provided.

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Proprietors : J. H. TUCKER & CO. LTD., Birmingham

Agents in South Africa: G. S. ROGERS (PTY.) LTD., P.O. Box 3667, JOHANNESBURG

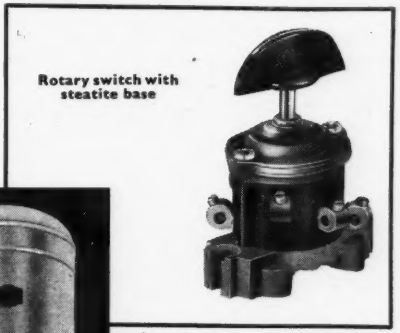
Water Heating

SPECIAL APPLIANCES TO MEET OVERSEAS NEEDS

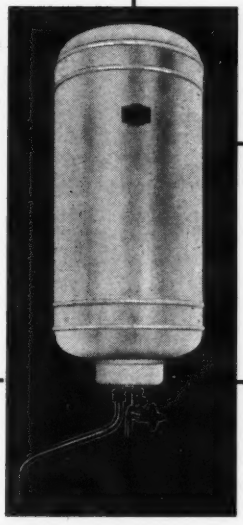
AN interesting visit was recently paid to the factory of Santon, Ltd., Somerton Works, Newport, Mon, who specialize in the manufacture of many forms of electric water heating apparatus, also rotary switchgear for all medium power circuits. Notwithstanding the appreciable demand for standard equipment, several special designs are now coming off the production lines to satisfy the particular requirements of steadily widening overseas markets. This has, in some instances, necessitated a complete departure from principles accepted in this country, to meet stringent and exacting regulations laid down by some overseas authorities.

Such a far-seeing policy is worthy of praise, for there is little doubt that with the advent of the buyers' market, local requirements will demand most careful consideration if export markets are to be held against ever-increasing foreign competition.

During the past few years, considerable quantities of standard thermal storage heaters, of non-pressure, pressure and cistern types, from 1¼ to 30 gal capacity, have been exported, the markets ranging from N.W. Europe to the Far East, including installations for several Colonial Government housing schemes.



Rotary switch with steatite base



About 550 of these non-pressure type thermal storage heaters have been supplied for a Colonial Government housing scheme

Rotary switch in Continental cover

This applies also to Santon immersion type heaters which are now appearing as an entirely new type of installation in some countries, and provide the answer where economy in expenditure is of paramount importance. The Santon instantaneous electric geyser is again in production, but in the latest streamlined form and in colours to suit Latin-American tastes.

The same principle has been adopted with regard to rotary switches in order to meet the requirements of the Continental markets. This has necessitated the complete redesigning of both small and large amperage types to Continental standards. Special tropical finishes are also supplied when necessary and large numbers of switches, so treated, have recently been sent to the Far East.

Tariff barriers, quota restrictions and currency difficulties, resulting in the imposition of import licences, have, to some extent, been a limiting factor in the propagation of sales in some countries, but based on their experiences to date Santon, Ltd., are con-

Water Heating (*Contd.*)

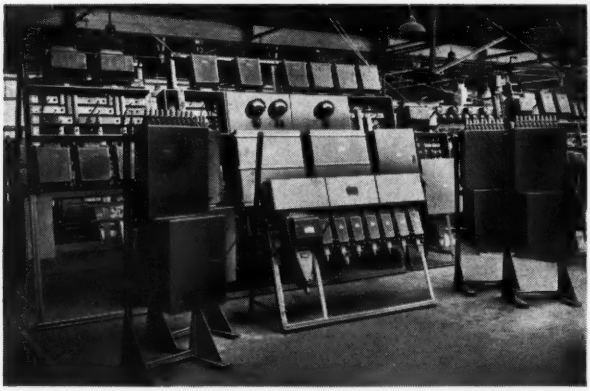
fident that an even greater volume of trade is possible, and with this end in view an entirely new factory of 80,000 sq. ft. floor area, double the size of the existing works, is nearing completion. It stands on a 32-acre site about half a mile from the present factory, and should be completed and ready for occupation towards the end of the year.

Expanding Exports

SWITCHGEAR MARKETS BEING SURVEYED

A CONSTANTLY expanding export trade is reported by G. P. Dennis, Ltd., Fleming Road, Speke, Liverpool, who are now conducting substantial business in South Africa, East Africa, India, Malaya, Egypt, Cyprus, the Middle East, Australia, etc. Surveys are being taken of the possibilities in other markets.

The company's standard fusegear is in constant and heavy demand, and switchboard and control panel production is also expanding rapidly, substantial contracts being in hand for a wide variety of industrial requirements. The accompanying photograph shows part of a consignment ready for packing, covering equipment for a textile mill in Syria, a hospital in Abyssinia and a macaroni factory in Cyprus.



Consignment of switchgear ready for packing at the works of G. P. Dennis, Ltd.

BRITISH DOMESTIC APPARATUS ABROAD

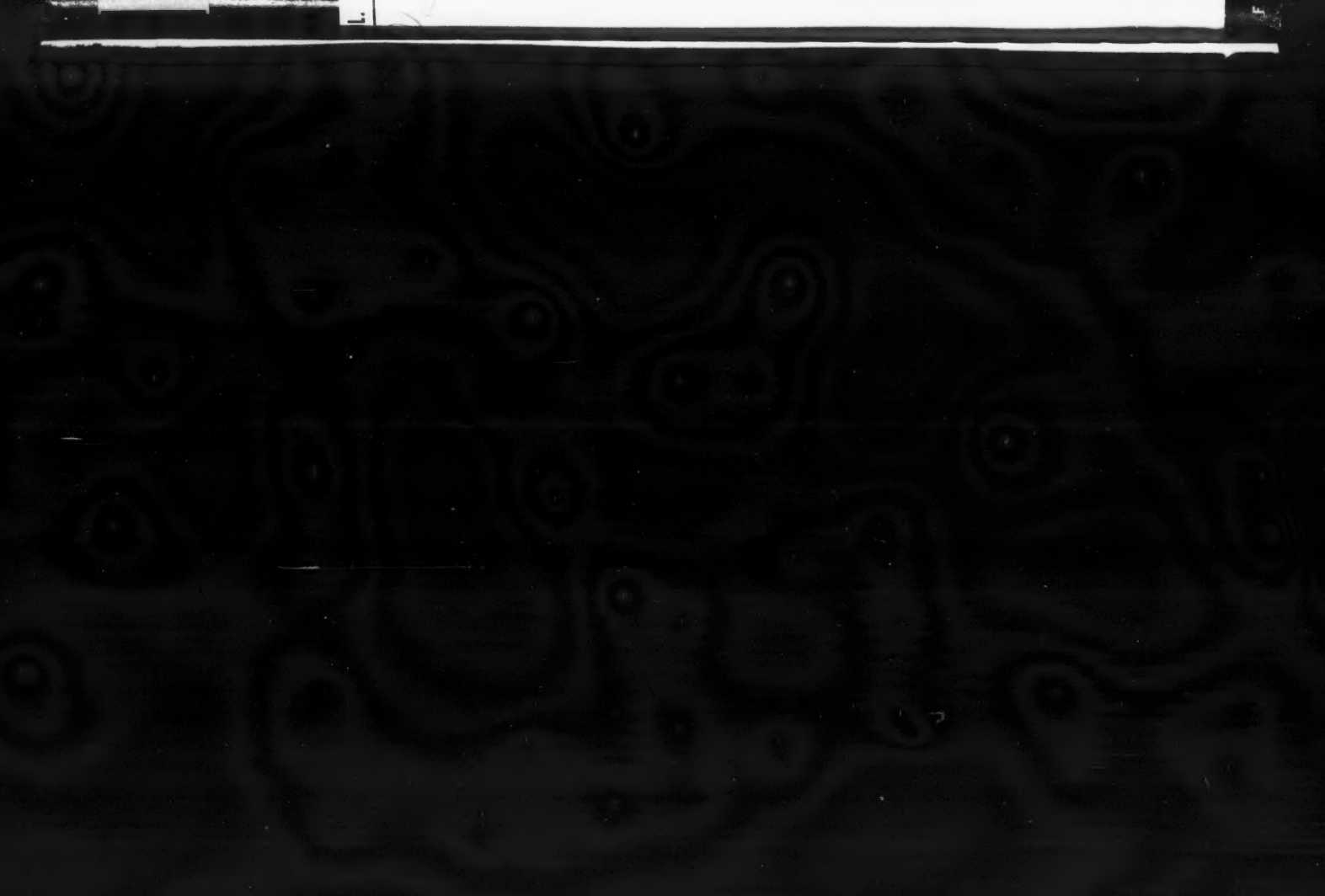
Popularity in Australia, New Zealand and Africa

RETURNING from a six weeks' tour of Australia and New Zealand, Mr. Charles Colston, chairman and managing director of Hoover, Ltd., stated that British goods were being enthusiastically received by Australian business men and housewives. More and frequent visits by British executives would give an invaluable impetus to the British export trade. During his tour Mr. Colston not only visited the newly formed Hoover subsidiary company and addressed meetings of industrialists on the problems of export relations, but also visited, in their homes, housewives who are using Hoover products.

In the meantime, Mr. S. T. Matthews, export director of the company, was investigating market possibilities in new areas of Africa and made an extensive tour throughout Kenya, Uganda, Tanganyika, Northern and Southern Rhodesia, and to the principal towns of South Africa. With labour shortage in Africa beginning to make itself apparent, there is a warm response to British labour-saving products.

Air-Blast Circuit Breakers

We regret that the wrong caption was published in the article on the above subject on page *E xv* of our May 13th issue. The illustration actually shows one pole of a 220 kV 3-phase air-blast circuit-breaker for Finland.



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